UNIVERSITY OF ST. MICHAEL'S COLLEGE
3 1761 01967615 4

SCIENCE OR ROMANCE?

REV. JOHN GERARD, S. J.

UNIVERSITY OF ST. MICHAEL'S COLLEGE
LIBRARY

SCIENCE OR ROMANCE?

BY THE

REV. JOHN GERARD, S.J.,

AUTHOR OF "SCIENCE AND SCIENTISTS."

UNIVERSITY OF ST. MICHAEL'S COLLEGE
LIBRARY

LONDON:
18, WEST SQUARE, S.E.
DEPÔT: 21, WESTMINSTER BRIDGE ROAD, S.E.

1891.

47012279

ROEHAMPTON:
PRINTED BY JAMES STANLEY.

UNIVERSITY OF ST. MICHAEL'S COLLEGE
LIBRARY

BY THE SAME AUTHOR.

Price One Shilling, cloth. By Post, 1s. 2d.

SCIENCE AND SCIENTISTS.

1. Mr. Grant Allen's Botanical Fables.
2. Sir John Lubbock on Flowers and Insects.
3. Some Wayside Problems.
4. "Behold the Birds of the Air."
5. How Theories are manufactured.
6. Instinct and its Lessons.

Each number separately, One Penny.

Opinions of the Press on "Science and Scientists."

"The papers are pleasantly written, and give evidence not only of abundant knowledge of scientific literature, but also of close and attentive study of natural objects. . . . Mr. Gerard is to be congratulated on having produced a book pleasantly written, free from dogmatism, well sustained, and full of interest."—*Journal of Botany.*

"Mr. Grant Allen is, in a fashion, hoist with his own petard, and finds he has a very different antagonist to deal with from those ponderous Dryasdusts who think it wise to conduct a guerilla warfare with an eighty-one-ton gun. . . . We can only advise all those who have read *Vignettes from Nature* and *The Evolutionist at Large* to carefully compare the conclusions arrived at in these volumes with the views set forth in *Science and Scientists.*"—*Nature Notes.*

"A series of papers pungently written, and directed against that unscientific use of the imagination which is frequent nowadays, and which will remain so as long as people prefer picturesque declamation and sensational statements to rigid information and accurate deduction. Mr. Grant Allen is one of the greatest sinners in this direction, and to him Mr. Gerard devotes much attention, and not without reason, for while botanists can distinguish between what is true and what is the product of Mr. Allen's fecund imagination, the general reader is likely to gulp it all down, fact and fiction, as unassailable dogma."—*Gardener's Chronicle.*

"Written by one who has a real grasp of the subject, and is capable of giving a sound answer to the plausible theories of modern scientists, and who can at the same time make the answer intelligible and attractive to unscientific as well as scientific readers. . . . Interesting and convincing; written in a bright and lively style. . . . They encounter the foe on a platform which he has hitherto regarded as his exclusive possession."—*The Month.*

London: 21, Westminster Bridge Road, S.E.

PREFACE.

In the Introduction to his *History of England*, Dr. Lingard wrote as follows: "It is long since I disclaimed any pretensions to that which has been called the philosophy of history, but might with more propriety be termed the philosophy of romance. Novelists, speculatists, and philosophists, always assume the privilege of being acquainted with the secret motives of those whose conduct and character they describe; but writers of history know nothing more respecting motives than the little which their authorities have disclosed, or the facts necessarily suggest."

It seems to be time that a similar canon should be applied to those works which deal with Natural History, and in the following papers a slight attempt in that direction is made, the key-note of them all being a contention that much which is presented to us under this title is Romance rather than Science—"philosophism," not philosophy.

J. G.

Stonyhurst, June 24, 1891.

CONTENTS.

	page
A Tangled Tale	1
Missing Links	25
The Game of Speculation	45
The Empire of Man	68
The New Genesis	83
The Voices of Babel	114

A Tangled Tale.

In the logical methods of our popular evolutionary teachers there is nothing more remarkable than the guileless and engaging simplicity with which they hold to the belief that it is quite possible at once to eat your cake and have it. The cardinal point of the doctrine they proclaim is that no purpose operates in Nature, and that the explanation of everything we see is to be found in the mechanical forces of matter. So far so good; the human mind, no doubt, finds a certain satisfaction in thus reducing to the simplest possible elements the machinery of the universe. But if purpose be abolished, the means of explanation which purpose affords must be abolished too; we can, in this case, no longer explain the forms and arrangements we meet in nature, by saying that they are means devised for the attainment of an end; that is to say, they will not be accounted for by anything that follows from them. It will obviously be no explanation of the shape of a flint hatchet to say that its form was needed for cutting, unless we suppose that it was meant to cut. If we once imagine such a stone to have been shaped by the forces of nature alone, we must face the difficulty of supposing the rain and the frost to have produced, without purpose, just such an article as purpose would have contrived. And in exactly the same manner, when we find such a structure as a bird's feather, so fashioned as exactly to meet the requirements of flight, we cannot, discarding the

idea of purpose, proceed to argue that the need of such an instrument for flying purposes accounts for its production: for where, in the nature of things, is the necessity that anything should fly? Unless it has been predetermined that flying creatures should be produced, a feather is a work of chance, evolved from dead matter by a series of lucky accidents, and flight itself is an accident, resulting from the chance production of various structures, feathers amongst them.

This is the situation which materialistic philosophy should face and account for; but, despite its professions, it never really attempts to do so. The idea of purpose, we are indeed assured, is overthrown, and many a war dance do we witness, executed over its prostrate form; but when the need for an explanation arises, an explanation which nothing else will furnish, the idea of a preordained end is quietly smuggled in, so wrapped up in words as not to appear what it really is; and as "inherent potentiality," or "correlation," or "heredity," or "epigenesis,"[1] or "ontogenesis," or "cephalization,"[2] or "molecular polarity,"[3] or under some other sounding name, a force is introduced which either means nothing at all, or means that there is some predetermination whereof the operation is visible.

These are, however, but satellites of the great central luminary of the evolutionary system—Natural Selection—and it is generally found more convenient to explain things simply by referring them to it.

[1] "In the progress of organic evolution, each stage determines its successor, consensus of the whole impressing a peculiar direction on the development of the parts, the law of epigenesis necessitating a serial development." (Mr. Lewes, *Fortnightly Review*, June, 1868.)

[2] "In these creatures (the cuttlefish), the tendency to head development, or cephalization, reaches its maximum." (Dr. Andrew Wilson, *Chapters on Evolution*, p. 362.)

[3] "The specific shape of an organic plasma is always dependent on the polarity of its molecules, and is due to the operation of immanent properties." (Lewes, *ubi sup.*)

Natural Selection, we are constantly assured, altogether dispenses with the need of purpose for the explanation of the world we see. Things, it is said, have come to be as they are, not because they were beforehand meant to be so, but because they have been made to be so through stress of circumstances. Every species of animals and plants tends to vary, in a greater or less degree, from the specific type. As there is a perpetual struggle for existence in progress amongst living creatures, which are produced in far larger numbers than the earth can support, those whose variations chance to be in an advantageous direction get a start in the race for life, and handing on their special variations, still more developed, to their posterity, they thus produce in course of time the infinite varieties of structure which the world of life exhibits. It is by taking advantage of such variations that man has been able to form his breeds of sheep, of horses, and of pigeons; it is so that the nursery-gardener produces his prize varieties of auriculas or jonquils, and the orchard-man of apples. He selects those spontaneous variations which tend in the direction he wants, and by judicious crossing he makes his animal or plant develope along that line. What man can thus do in a brief time, nature has surely been able to do in the countless ages at her disposal; and thus in the constant perpetuation of whatever is better for the purposes of life, we have a full and satisfactory explanation of every part of the machinery of nature we so much admire; for in the mere fact that each portion thereof exists, we have a clear proof that it is better for its particular purposes than are others; a proof just as clear as we should have, were we to know that it had been specially designed.

Such is the nature of what is commonly described as the "Force of Natural Selection;" but, whatever else may be said of it, it is obvious that in no true sense is it either a *force* or a *selection*. It can no more be called the force originating development than a window can be called the cause of light in a room,

or than a net is the cause of little fishes slipping through its meshes. All that, according to the showing of its advocates, Natural Selection does for development is, not to arrest its progress along certain lines: its function must, at best, be purely directive, and, without a true force to direct, it would be as powerless as would be a coachman without horses.

But—which for present purposes is even more important—if it has no rightful claim to be called a force, it has still less to be called *selection*, and this title which it has appropriated has done more to veil its nakedness than any advocacy, however able. For the term "selection" at once introduces an idea which appears to furnish the theory exactly with that which it most grievously lacks.[1] Natural Selection is compared with artificial selection, as though they were analogous. But man's selection *is* a selection: individuals of a species are picked out for a purpose; they are made means to an end; and subsequent development is thus removed from the domain of chance. In Natural Selection, on the other hand, the goal to be attained can in no way serve to guide the course; progress is left to chance, and the chances are against it. This it is, more than anything else, which renders impossible the process of development by Natural Selection. Let us suppose a quality to be required by man among some of his domestic animals, for instance, long straight horns among his cattle. Some of the young animals born in his herd will have horns slightly longer and also straighter than their crumple-horned parents. He *selects* individuals of this type, and pairing these he secures that there shall be individuals in the third

[1] Dr. Andrew Wilson, an enthusiastic Darwinian, is very jubilant over this title, but fails to note the point which his laudation of it serves powerfully to emphasize. He writes: "The term 'Natural Selection,' applied by Mr. Darwin to his theory of evolution, is in itself a highly expressive designation. It indicates an analogy with the process of 'selection' whereby man *chooses the animals he intends to breed from*." (*Chapters on Evolution*, p. 7.) But this is precisely what Nature cannot do.

generation still farther developed towards the ideal with which he started; and so on till that ideal be attained. But if the same work be left for Natural Selection to do, the conditions are altogether changed, the one element that in the former instance secured success being omitted—the element of *selection*. No doubt there will still be in the second generation individuals showing a slight tendency in the required direction; and if one individual could hand on the race, we might indeed expect to find the feature still more developed in the third generation. But a mate is needed, and the concurrence of a pair duly qualified to transmit the development, must be purely fortuitous; for the first minute stages of variation are insufficient to account for selective preference.

If, therefore, starting from a generation of undeveloped animals, we suppose that in each succeeding generation so large a proportion as one half vary in the right direction, and that consequently one half of the second generation are so developed, the chances will still be even, that each of these developed individuals will find an unsuitable mate, a mate whose development is not in the same line; and that development will consequently be arrested. One half of the individuals capable of transmitting the development being duly mated, or one fourth of the whole race, one half of their offspring (one eighth of the whole), will, on our supposition, carry the development a stage farther. But the chances are now only one in eight of their making a suitable match, or seven to one against it. That is to say, each of the duly developed has seven wrong mates to choose, for one right one; and but one eighth even of the selected band (or one sixty-fourth portion of the whole) can succeed in transmitting the development. So the improbabilities continue to augment; in the next generation the representatives of development will be to the undeveloped but as one to a hundred and twenty-seven, and the chance of a suitable pair occurring will have reached the hopeful figure of one to 16,383. This only in the fourth

generation. The improbability will of course increase in a like ratio at each step, that is to say, for all practical purposes, probability disappears at once.[1] It would in fact be vastly more likely that we should cast aces three hundred times running, with a pair of unloaded dice, or toss "tails" two thousand times with an honest coin, than that a development should be handed down by Natural Selection through ten generations, even if we start with so favourable a supposition as that one half of the offspring tend to vary in the required direction. What would it be if we were to take the number as one in twenty, or one in two hundred, though even that, as we shall presently see, must be immensely beyond the truth? But giving chance the most favourable odds, this is all it can make of them; and chance, be it once more observed, is the ruling power of development, unless there be predetermination; and if there be, it is predetermination, not Natural Selection, that accounts for development towards the predetermined end.

It is thus evident that there is no true parity between man's selective power, and that by a false analogy attributed to nature. Man loads the dice, and therefore is sure of his throws. Nature, on the Darwinian hypothesis, plays with unloaded dice, and therefore she cannot rival the feats of the human player. It will also be seen that the element of time, on which evolutionists so much rely, avails them nothing. Even were astronomers willing to allow, as they are not,[2] the hundreds of millions of

[1] Taking $\frac{1}{4}$ as the probability of a suitable pair in the second generation, the figure in each succeeding case is found by dividing the preceding fraction by 2, and squaring the result so obtained. In the fifth generation the probability would therefore be as $\frac{1}{1073741824}$.

[2] "What then does the physicist tell us was the initial condition of this globe? I will not go into the vexed question of geological time, though as a geologist I must say that we have reason to complain of Sir W. Thomson. Years ago he reduced our credit at the bank of time to a hundred millions of years. We grumbled, but submitted, and endeavoured to diminish our

years which Darwinians postulate for the world's existence, it would only make their case worse, for their mass of improbabilities, like a monster snowball, gathers as it goes.

Such, then, is the "force" that is so confidently invoked to account for the complicated machinery of nature. Natural Selection is constantly spoken of as though it were a magician that could at any moment bring out of the hat whatever was at the moment needed; and a creature's demand for new apparatus is represented as in itself enough to create a supply, just as though there were a benevolent rich uncle to appeal to. Having seen what Natural Selection really means, it will be instructive for us to consider some examples of the manner in which the Darwinian theory is worked by its advocates, and observe how invariably they ignore the fact that it is chance factors they profess to be working with, and invoke anything but chance to account for facts.

Mr. Grant Allen, who is certainly amongst the most popular exponents of the creed, affords us an excellent instance in his essay on the skeleton of a crow.[1] He picks out from it the clumped tail bone, "a strange fragment truly," he tells us, "with a strange history." Birds, he goes on, are a development from reptiles; reptiles have long bony tails, the tail of a bird consists of "several separate vertebræ, all firmly welded together by a single piece." How came this transformation of the member? "It is," he assures us, "not difficult to see." The tail, in its elongated form, is useful to swimming reptiles, and to reptiles that glide on land, like lizards and serpents: these therefore have kept it. "But to flying birds, on the contrary, a long bony tail is only an inconvenience. All that they *need* is a little muscular knob

drafts. Now he has suddenly put up the shutters, and declared a dividend of less than four shillings in the pound. I trust some aggrieved shareholder will prosecute the manager." (Professor T. G. Bonney, *The Foundation-stones of the Earth's Crust.* Brit. Association, 1888. See *Nature*, November 22, 1888, p. 93.)

[1] "A Study of Bones," *The Evolutionist at Large*, pp. 59—66.

for the support of their tail feathers, which they use as a rudder in guiding their flight. *Accordingly*, the bones *soon grew fewer* in number *and shorter* in length, while *the feathers simultaneously arranged themselves side by side* on the terminal hump." A simple and easy explanation surely! We have seen how Natural Selection would work in the simplest possible case, in the modification merely of one organ, and that in size and shape only. And if even there it seemed hopelessly incompetent for the task, what are we to say of the load of work thus carelessly cast upon its shoulders? The bones grew *fewer:* let that pass; and *shorter:* how was it arranged that these two variations should coincide in the same creature, still more in the same pair? And unless they coincided, and continued to coincide, through succeeding generations, we have no sort of explanation of the result we see. Yet the improbability of this coincidence is the multiple of the improbabilities already considered. Then the feathers, where did they come from? We are told that they are developed scales.[1] But what a development is here! and what a playground for the vagaries of chance! A feather, however it may have been produced, is a most artistic structure, exactly fitted for the needs of birds. It is strong and yet light, yielding and yet elastic, its parts adhere without clogging, and separate without a fracture. How was such an instrument carded out of the homogeneous plate of a lizard's scale? How did any two of the required qualities happen to coincide? The structure of the mid-rib and of the web, for instance? or of any two strands composing the web? A feather, to have been made by Natural Selection, should have been made piecemeal; there could not possibly have been a movement through all the parts of a scale towards the corresponding parts of a feather, unless under the influence of a force tending definitely to

[1] "The plumage, which seems to impress a specific character upon the bird, is therefore to be traced from the formation of scales." (Oscar Schmidt, *Doctrine of Descent*, p. 265.)

create a feather; and such a force implies an end, which is precisely what Darwinians preclude themselves from supposing.

The structure of a single feather, therefore, unites in itself scores of such improbabilities as we have seen to be singly so overwhelming. And how does the formation of one feather account for the formation of another, unless we again introduce a feather-making force? How in particular does the production of a quill account for a plume of down, or of any of the totally different forms that feathers take? Again, even granting feathers, how came they to *arrange* themselves just in the proper fashion, a fashion very different from that of scales? And how, above all, account for all these various features — fewness of bones, shortness of bones, feathers and arrangement—having agreed to meet in one and the same tail? It may be that, as Mr. Grant Allen goes on to pronounce, "one will find the philosophy of tails eminently simple," but assuredly this will not be the case on the principles by which he professes to steer. I say *professes*, for never for one moment does he really attempt to do so. At every step he calls in the aid of the end to be attained in order to account for the existence of the means for attaining it. The birds get the tail they have because they "need" it for flying: the frog as a tadpole has a tail,[1] because he "needs" it to swim, and afterwards drops it, because it would be an encumbrance: the lobster has a powerful muscular tail, because he "requires" it for his particular mode of life,[2] and the crab has but a stump, because to him a tail would be "useless;" and in fine, as to tails in general, "Those animals that *need* them evolve them; those animals that do not *need* them, never develope them; and those animals that have once had them, but no longer use them for *practical purposes*, retain a mere shrivelled rudiment, as a lingering reminiscence of their original habits."[3]

[1] p. 64. [2] p. 66. [3] *Ibid.*

Thus does the Darwinian theory fare at the hands of its friends. The explanation of an organ is always found in the purpose it serves, in that which follows from its production. It is only by starting from the idea of its function that our theorist can, in his own words, "spell out" an organ's history. He does not find the explanation of the effect in the cause, but of the cause in the effect. A bird's motion in steering is the effect of its tail, yet the argument we have heard is, not that it steers because it has a tail, but that it got a tail in order to steer. The result is thus presented to us as, in a true sense, the cause of its cause, the cause of that which physically produces it. The cause which physically produces an effect is styled by philosophers as an *efficient* cause. A *designed* effect, however, causes its designer to contrive causes efficient to produce it; and of these it is therefore termed the *final* cause. Thus the laying of bricks and the sawing of rafters are the efficient causes of the production of a house; but on the other hand, the production of a house is the final cause that makes bricks be laid and timbers cut. We can, in this way, explain the existence of efficient causes by the resulting effect, only if we suppose the effect to have been predetermined, and the efficient causes on that account set in motion. We cannot account for the rubbing of two boughs in a gale till flame appears, by saying that the forest is burnt down in consequence; but the cooking of his dinner satisfactorily accounts for the rubbing of two fire-sticks by a Hottentot. To say therefore that a steering apparatus resulted from the need of steering, or that wings are explained by the requirements of flight, is to say that the power of steering or flying was designed before the needful apparatus was constructed.

This is a point of supreme importance, inattention to which is productive of much confusion. Evolutionist philosophers, who dislike above all things, and most naturally, the word "chance" in connexion with their system, are wont to contend that

chance does not exist, because the effects we see necessarily follow from the efficient causes which produce them. Taking as proved the doctrine of the descent of one class of plants or animals by development from another, an assumption with which for present purposes we need not quarrel, they proceed to argue that, as each change effected in the process is the necessary result of the forces which effect it, the mechanical forces producing development are obviously sufficient to account for all those forms which they have in fact produced. As Dr. Oscar Schmidt puts it:[1] If we start from the bird and go back to the reptile, we can trace the chain of effects and causes that changed the one into the other, a chain so compacted as to have no room for chance. Why then speak of chance when we start from the reptile to proceed forwards to the bird? The chain is the same, only its links are followed in the opposite order. It is only our ignorance that prevents us from tracing the connexion of cause and effect forwards as well as backwards, and if we knew more of the laws of Nature, we should be able to foretell what will be, as we can now recapitulate what has been. Therefore to allot a place to chance is but a weakness of "purblind humanity," and, as Mr. Grant Allen tells us,[2] to speak of the "accidental" is to employ an "unphilosophical expression."

It would appear that to those who so confidently employ it, such an argument seems to have a meaning, especially when they talk, as does Dr. Schmidt,[3] of the "quackery" and "jargon" of their opponents. Yet to what, after all, does their argument amount? Simply to this, that effects necessarily follow from their efficient causes; that given the cause we are sure of the effect. Of course we are. Any series of natural operations depends wholly on this principle; if the various effects did not follow from their several causes as a matter of course, the process would not

[1] *The Doctrine of Descent and Darwinism*, p. 193. (International Scientific Series.)

[2] *Evolutionist*, p. 200. [3] *Doctrine of Descent*, p. 2.

be natural. If therefore we suppose development to have been worked out by natural laws, we assume, in that very supposition, the chain of natural causes and effects, which, being as it is, could not have resulted otherwise than as it does. But how does this affect the question of purpose or chance? It is precisely in the selection of causes calculated to produce a desired effect that purpose is discovered, and it is the absence of such selection that constitutes chance. Causes there must be, if there is to be change of any sort; and purpose can work only by their instrumentality. Take, for example, the key which fits the complicated lock of a banker's safe; its precise form, down to the minutest particular, is the necessary result of the various operations of forging and filing to which it has been subjected. Given these, it could not possibly be otherwise than as it is. But the point to remark about it is, not that it has a definite shape, which every material thing must have, but that it exactly fits the lock. This is the coincidence which we find impossible to explain on any supposition except that it was meant to fit it. It is obviously no explanation of this fact to say that it fits because it was forged and filed exactly as it was, unless we can also say how it came to be so forged and filed.

Now it seems to be too often forgotten that in Nature mechanical problems are solved, infinitely more difficult than that of fitting a key to a lock, or making a watch, or building an arch; problems in which there must be absolute accuracy of result in all parts, and wherein any defective portion would vitiate the whole; and it is the exact fitness of organic structures to satisfy such complex requirements, that is the plainest and most palpable evidence of the presence of design.

An explanation is in fact worthless unless it suffice to account for *all* essential phenomena, and there is one phenomenon, the most noteworthy of all, whereof the materialistic theory can give no account, the coincidence, namely, between the effect a mechanical

cause produces, and something existing beyond, quite independently of that effect and of its efficient cause. Granting that hammer and file must change the shape of a piece of iron, how comes the metal fashioned by them to be a key, capable of opening or closing a lock? And in just the same manner, supposing mechanical forces to have turned a scale into the finest of combs, how is it that the article so fashioned is a feather, exactly meeting the requirements of flight, requirements which the feather does not create, but which it exactly satisfies? As Newton exclaims, "Is it possible that the maker of the eye was ignorant of the laws of optics?" And in like manner we may ask whether wings were made without full understanding of all those complex problems which we have to solve in order to explain their use.

Therefore unless we presume a final cause, there is a gap in the chain of causality, a gap which chance, and chance alone, is left to bridge; and we can thus estimate at its true value the logical worth of the conclusion with which Dr. Oscar Schmidt declares himself satisfied. "Any one," he tells us, "who fancies himself present at the genesis of the reptiles, may, from his antediluvian observatory, look upon the development of the reptile into the bird as a 'chance,' if he does not peradventure regard it as predestined. To us, who trace the bird backwards to its origin, it seems the result of mechanical causes."

Clearly, therefore, Dr. Schmidt conceives that this backward process of argument, from effect to cause, reverses not only the order of phenomena, but the laws of logic as well, and solves all difficulties without the agency either of chance or of design. How can it be imagined that it does so? A structure exists, called a feather, suitable for a creature that shall fly:[1] this is the final point from which we start

[1] A typical feather is thus described by Dr. Alleyne Nicholson (*Manual of Zoology*, p. 425): "The inferior surface of the shaft always exhibits a strong longitudinal groove, and it is composed

to reckon back. How comes this structure to be fit for purposes of flight? Obviously not merely because material forces produced it somehow, but because they made it *fit*. We may account for its weighing a grain, by saying that a grain of matter was incorporated in it; or for its whiteness by saying that it has been chemically bleached; but how about its *fitness?* This is not explained till we trace it to a cause determined to its production, as a chemical cause may be determinative of colour, or a mechanical cause of weight. Either, therefore, we come somewhere to a cause determined to production of fitness for flight, or such fitness arises without a cause. In the one case fitness is predestined, in the other it is a chance. Where is the possible middle term between the horns of this dilemma?

It thus appears that "chance" has a very definite and real meaning, evolutionist assertions to the contrary notwithstanding. Professor Huxley, for example, talks[1] of "chance-worship" as being "the most singular of these, perhaps immortal, fallacies, which live on, Tithonus-like, when sense and force have long deserted them." According to him, those who talk of chance commit the absurdity of signifying an independently existent being, like the Pagan goddess Fortuna, and he challenges his adversaries to define their meaning otherwise. This is easily done. Chance

of a horny external sheath, containing a white spongy substance, very like the pith of a plant. The shaft carries the lateral expansions or 'webs' of the feather, collectively constituting the 'vane.' Each web is composed of a number of small branches, which form an open angle with the shaft, and which are known as the 'barbs.' The margins of each barb are, in turn, furnished with a series of still smaller branches, known as the 'barbules.' As a general rule, the extremities of the barbules are hooked, so that those springing from the one side of each barb interlock with those springing from the opposite side of the next barb. In this way the barbs are kept in apposition with one another over a greater or less portion of the entire web." In the case of non-flying birds, such as the ostrich and emu, the barbs are disconnected.

[1] *Life and Letters of C. Darwin*, ii. pp. 199, seq.

is the coincidence of independent phenomena, that is, of phenomena not co-ordinated to an end. This would seem to be plain enough, yet, to judge from the example which the Professor selects to confound his opponents, he does not appear to have seized the point. He describes, in vigorous language, a storm raging on the shore: here, if anywhere, he tells us, will it be said that chance rules supreme: "but the man of science knows that here, as everywhere, perfect order is manifested; that there is not a curve of the waves, not a note in the howling chorus, not a rainbow-glint on a bubble, which is other than a necessary consequence of the ascertained laws of Nature." Obviously true; but what then? It would be impossible to select an example more utterly wide of the mark. The phenomena here described end with themselves, they lead to nothing else; nothing follows from them. They are mere effects and not, so far as we know, a means to obtain a result beyond. The one element, therefore, which constitutes chance is wanting here. Undoubtedly waves curl according to the laws of mechanics, and bubbles glint according to those of light. So do feathers; but does that fact sufficiently explain the painting of a peacock's train? If it did, Mr. Darwin would surely not have been confronted by the difficulty in the way of his theory which he so honestly describes,[1] "The sight of a feather in a peacock's tail, whenever I gaze at it, makes me sick."

Truth to tell, in spite of their indignation against the lax reasoning of their adversaries, it is quite impossible to make out what Darwinians themselves mean. Given the laws of nature as they are, the results must, of course, be as we witness; but the whole question is, How came they to be so given? Professor Huxley apparently conceives that he solves the difficulty when he tells us[2] that Mr. Darwin's whole theory "crumbles to pieces if the uniformity and regularity of natural causation for illimitable

[1] Letter to Asa Gray, *Life*, ii. 296. [2] *Ibid.* p. 199.

past ages is denied." But assuredly if everything must have a cause, this uniformity and regularity must have one; and if everything depends on these, all ultimately depends on the cause producing them. It is of this cause that we are in search. How does Professor Huxley aid the quest by declaring[1] that the region of true science is "free from the snares of those fascinating but barren virgins, the Final Causes, against whom a high authority has so justly warned us." What this may mean it is hard to conceive: it seems much of a piece with the daring philosophy that prophesied

> Cause and effect shall from their thrones be cast
> And end their strife with suicidal yell.

Nor can such a principle lead to any state of mind more satisfactory than the puzzlement in which Mr. Darwin himself was landed, and which he lugubriously confessed to Dr. Asa Gray, pleading guilty at the same time to that reliance on chance with which according to Professor Huxley no one can possibly charge him. "I grieve," he writes,[2] "that I cannot possibly go as far as you do about design. I am conscious that I am in an utterly hopeless muddle. I cannot think that the world, as we see it, is the result of chance: and yet I cannot look at each separate thing as the result of design. . . . Again, I say I am, and shall ever remain, in a hopeless muddle."

To take a few examples more in illustration of this essential point. The form of Phidias' statue of Olympian Zeus is no less due to a mechanical cause, the artist's chisel, than that of Mount Blanc is due to glaciers and weather. In the arrangement of letters known to us as *Paradise Lost*, we find the effects of a mechanical cause, the hand that wrote them, or the compositor who set the type, exactly as in that of toy letters tumbled by a child about the nursery floor. The iron which composes a steam-

[1] *Life*, ii. p. 254. [2] *Ibid.* p. 353.

engine can no more help being where it is, and as it is, than the ore at the bottom of a mine. What we find ourselves compelled to seek in the one set of instances and not in the other, is a cause sufficient to account not merely for the existence of the effect, but for that effect being just what it is. In each series of cases mechanical forces actually produce the observed effect; but it does not thence follow that in each are mechanical forces, by themselves, equally sufficient to account for results.

In fact there is one way, and only one, of ejecting chance from the materialistic system, which is by invoking necessity; by saying that things were from the beginning so arranged as to give but one possible set of results, the set actually produced. To such a solution are writers like these, sooner or later, compelled to betake themselves, whatever be the profession of faith with which they start. Thus, in spite of what we have heard, Dr. Schmidt lays down[1] that "our conviction of the truth of the doctrine of derivation is due to its *adjustment* of the phenomenal series of causes and effects," and that "if we were in possession of the formula of the universe, all future evolutions might be computed in advance." But this is to say that they are predetermined by some law, or else how are they to be computed? Astronomers can calculate the motions of a planet only because these are determined and necessary. And if so, what becomes of Natural Selection as the ruling force of development? It will then be but a part of the machine, "adjusted" so as to select the right things, just as the pins in a musical box are adjusted to strike the right notes. It is not therefore Natural Selection, but the cause adjusting it, to which the final effects must be due. Yet Dr. Schmidt is preaching Natural Selection in the very work in which he thus abolishes its potency as an independent force; while Mr. Grant Allen, who is nothing if not Darwinian, is at the same time pleased to call himself a "Determinist."[2]

[1] p. 193. [2] *Evolutionist*, p. 145.

In the next place, even from the determinist standpoint, to say that a machine is adjusted towards a certain work is not a final explanation. We must know what adjusted it; and if we go, as science bids us, to experience for explanation of phenomena, we know of but one way in which such adjustment may be secured, and that is, by foreknowledge of the end, and by a design to attain it. Fitness is a quality to be recognized not by an eye, but by a mind,—to be produced not by a simple effect, but by arrangement of effects. From our experience it is impossible even to conceive how anything but conscious intelligence can make such an arrangement.

A bird's tail, it would thus seem, is not altogether easy of explanation on Darwinian principles. But all this is only the beginning of troubles. A bird is not all tail, nor only in its tail does it differ from a reptile. Its limbs are different, its heart is different, its circulatory system is different, and in a word, although there are to be found several important similarities in the two classes, it nevertheless remains true that no creatures are more unlike than a bird and a reptile.[1] Therefore, if we suppose the one to have been developed from the other, we must imagine that while the tail was being transformed as we have seen, the fore limbs were changing into wings, the hind limbs into legs fit for a biped, the heart was becoming four-chambered instead of three-chambered, a complete double system of circulation was being set up, the blood was becoming extraordinarily hot,[2] all the scales were changing into feathers, and to feathers of very different form and fashion according

[1] "It is, no doubt, at first sight an almost incredible thing that there should be any near bond of relationship between the birds and the reptiles, no two classes of animals being more unlike one another in habits and external appearance." (Dr. Alleyne Nicholson, *Manual of Zoology*, p. 393.)

[2] The average temperature of blood in birds is as much as 103° to 104°, in reptiles it is little warmer than the surrounding medium.

to their different functions, and an oil gland was being provided to lubricate them; to say nothing of less easily observed modifications of muscles, nerves, bones, lungs, and stomach. Modification of each of these organs includes a host of separate modifications; and all this countless multitude of changes must be simultaneously operated, by chance, in the same subject, or rather at least in two. Of what possible good could it be to a creature to get a steering tail without propelling wings? or to have the skeleton of its fore-limbs fashioned to wing-like form if it remained clothed with scales? how even with wings and tail would a bird fare in the air if its three-chambered heart afforded it only the sluggish blood of a reptile? or how could feathers be aught but an encumbrance, without nature's varnish to keep them waterproof? Some of these organs, moreover, are far more complex, and exhibit more adaptation to a purpose, than that with which we started. The wing, for instance, is thus described by Mr. Pettigrew:[1] "There are few things in nature more admirably constructed than the wing of the bird, and perhaps none where design can be more readily traced. Its great strength and extreme lightness, the manner in which it closes up or folds during flexion (ascent), and opens out or expands during extension (descent), as well as the manner in which the feathers are strung together and overlap each other in divers directions, to produce at one time a solid resisting surface, and at another an interrupted and comparatively non-resisting one, present a degree of fitness to which the mind must necessarily revert with pleasure."

The heart also is a structure worthy of remark. That of reptiles is three-chambered, and does not avail to keep arterial and venous blood wholly separate. But birds have a four-chambered heart which effectually separates the two currents, a heart agreeing in this important respect with that of

[1] *Animal Locomotion*, p. 180. (International Scientific Series.)

mammals. Yet birds and mammals have, we are told, been both developed from reptiles, but along wholly separate and distinct lines; each must, therefore, independently, have hit by chance upon the same formation for this most vital organ. Is this a more philosophical explanation than to say that creatures having like needs were designedly supplied with like instruments?

Such then is, in merest outline, an indication of the difficulties that confront the theory of development by Natural Selection alone, that is, of development by chance; the factor to which Darwinians profess to restrict themselves. Thus Mr. Grant Allen himself tells us[1] that the results we see "are in the last resort dependent upon all kinds of *accidental* causes—causes, that is to say, into which deliberate design did not enter as a distant factor."

Can men realize the meaning of their own words when they declare that a process thus governed could have succeeded in making a bird that should fly, or any single feather upon it? Yet such is the doctrine they profess to teach—a doctrine, the rejection of which, we are constantly informed, is due to unscientific bigotry alone.

Having thus attempted to understand the true state of the case, let us, for a little, return to our original task of observing how the theory is worked in practice, and how its difficulties and impossibilities are ignored. After the examination which we have been making it will be unnecessary to comment as we proceed on the various evolutionary stories told us, it will be enough to listen and admire.

Here for example is the plain and simple history of the manner in which the *Cyclostoma*, a land-snail, was developed from the *Paludina*, a water-snail.[2] "It is in fact, one of these gill-breathing pond-snails which has taken to living on dry land, *and so has acquired the habit of producing lungs.* All molluscan lungs are *very simple:* they consist *merely* of a *small sac*

[1] *Evolutionist at Large*, p. 205. [2] *Ibid.* p. 177. Italics mine.

or hollow behind the head, *lined with blood-vessels*. So primitive a mechanism as this *could be easily acquired* by any soft-bodied animal like a snail."

But the caterpillar would appear with equal ease to have acquired far more complicated apparatus. We are constantly told that the developments of form which the individual undergoes in its imperfect state, are a summary history of the developments of the race. In hearing, therefore, what each caterpillar of to-day does, we understand what the race of which caterpillars come has done. This is the history given by Mr. Grant Allen of the transformation of a caterpillar.[1] "After a considerable span of life spent in feeding and walking about in search of food, the caterpillar one day found itself compelled by an inner monitor to alter its habits, and sank peacefully into a dormant state. Then *its tissues melted* one by one into a kind of organic pap, and *its outer skin hardened* into a chrysalis. Within that solid case *new limbs and organs began to grow* by hereditary impulses" (an assistance, by the way, which in the original development the race cannot have had). "At the same time *the form of the nervous system altered*, to suit the higher and freer life for which the insect was unconsciously preparing. *Fewer and smaller ganglia now appeared* in the tail segments, while *more important ones sprang up* to govern the motions of the *four wings*. But it was in the head that the greatest change took place. There a *rudimentary brain made its appearance*, *large optic centres* answering to the *far more perfect and important eyes* of the new butterfly. *For* the flying insect will have to steer its way through space, . . . which *demands* from it *higher and keener senses* than those of the purblind caterpillar."

As with animals, so it is with plants. This, for instance, is how nettles came to sting.[2] "These hairs are often more or less glandular in structure, and therefore liable to contain various waste products of the plant. *Suppose* one of these waste products in

[1] *Evolutionist*, p. 147. Italics mine.
[2] *Vignettes from Nature*, p. 117.

the ancestors of the nettle to be at first slightly pungent, *by accident as it were*, then it would exercise a slightly deterrent effect upon nettle-eating animals. *The more stinging it grew*, the more effectual would the protection be; and as in each generation the least protected plants would get eaten down, while the more protected were spared, the tendency would be for the juice to grow more and more stinging till at last it *reached the present high point* of development."

As we have been told that the *Cyclostoma* is a water-snail that has taken to living on land, so on the same authority,[1] the water-crowfoot is a buttercup that has taken "to living pretty permanently in the water." Of course it has found it a matter of equal ease to modify its organs accordingly, cutting its leaves into threads and lengthening its stem, because without the one arrangement it would have been smothered, and without the other swamped.

We might go on multiplying such examples indefinitely, so let one more suffice. The hedgehog and mole, according to the Darwinian account,[2] are mammals of the lowest type found in this country, which have survived in spite of developments going on around them, because they have accepted "menial or dishonoured places" in Nature's household, skulking about by night, or leading a burrowing sunless life, and so picking up a livelihood where more ennobled creatures disdained to seek it. But even these low beasts have been wonderfully "specialized" for their ignoble purposes. The hedgehog has contrived his wonderful suit of spike armour, because without it his slowness and stupidity would have made him too easy a prey to his enemies; while the mole has quietly possessed himself of "the *peculiar powerful shovel hands*, *the hidden eye*, *the covered ear*, and the *close fur*, which *fit it so well* for its underground life."

Always in fact the root question of all is utterly ignored. Why should there be life at all? Why

[1] *Vignettes from Nature*, pp. 36, &c. [2] *Ibid.* pp. 58, &c.

should creatures survive? Why should flying or swimming or burrowing animals exist? Leaving out of consideration the question as to why inanimate matter should combine into living organisms, how shall a creature unfit to live in one set of circumstances, obtain the means to live in another, unless he is meant to live? For ages the earth was without life; for ages more without animal motion, swimming, crawling, walking, flying. Why did it not for ever remain so? How did the needs of creatures create their own supply, instead of killing off the needy race? That would be the obvious and inevitable effect of their deficiencies, unless the deficiencies were provided for, and their supply designed.

The fields of air doubtless lay waiting to be occupied, till the first flying creatures appeared; even as America lay waiting for Columbus. But of what avail was this to creatures that could not reach them? The existence of America did not build ships to take emigrants there, nor did lack of clothes invent the spinning-jenny. The arch-contriver man is no doubt stimulated by an object worth attaining, to devise means for attaining it; but he it is, not the enticing object, that creates the means. And so the air might have remained for ever fit to be the highway of birds, yet its highway have been untrodden for want of creatures capable of treading it. The water is capable of floating a boat, but that does not relieve us from the necessity of building boats that will float; nor could the air have been invaded, had not Nature contrived a mechanism that should satisfy the laws of pneumatics; it was full of good things, but for those only who could reach them.

It is by suppression of simple and obvious considerations, such as these, that the manufacture of evolutionary romances is rendered possible, for the benefit of a confiding public. The methods of this manufacture are excellently illustrated in the practice of Mr. Gilbert's ingenious but untrustworthy Japanese hero Poo-Bah, who appropriately described himself

as able to trace his ancestry "to a protoplasmal primordial atomic globule." The imaginative trappings, with which our evolutionist legends are tricked out, serve precisely the purpose he claims for the embellishments of his fiction, "Merely corroborative detail, intended to give artistic verisimilitude to a bald and unconvincing narrative."

To which, it will be remembered, his interlocutor replies, "Corroborative detail indeed! corroborative fiddlestick!"

Missing Links.

For students of Darwinism nothing can be more opportune than the appearance of such a work as that lately presented to us by Mr. Wallace.[1] No man now living has a better right to speak for the theory of which he is the joint, if not the original, author, while the space of time elapsed since Mr. Darwin's death has produced a mass of observations shedding a flood of light on almost every point of the question which has to be discussed. Therefore when Mr. Wallace sets himself to exhibit Darwinism for us in the clearest light, we may reasonably expect to be enabled at least to grasp the outlines of the system as a connected whole, and to perceive with some completeness the series of arguments by which its adherents believe it to be established.

And yet there must be some who rise from the perusal of the book bewildered rather than enlightened, and with less assurance even than before that they have got so far as to know what the Darwinian theory is. Such a state of mind would have a good deal to show in its own justification by raising various pleas on the evidence which Mr. Wallace affords, but for the present it will be enough to confine our attention to one.

From the fuller light which has now been cast on the facts bearing on the evolutionary theory, a result

[1] *Darwinism: an Exposition of the Theory of Natural Selection, with some of its applications.* By Alfred Russel Wallace, LL.D., F.L.S., &c. Macmillan and Co., 1889.

would appear to follow analogous to that which might conceivably ensue from a fuller examination of the geological record. Increased knowledge of that record might without doubt contradict the Darwinian theory of evolution. Darwinians have never pretended that we have direct evidence of the existence of all the forms of life in whose existence they believe. The species, whether living or extinct, which have been presented to actual observation, are but as a scattered group of islands, the relics of a vanished continent. Their contention is, that with means of observation more ample than we have, we should find the intervening chasms to have been once solidly bridged, by grades of life shaded by scarce perceptible gradations, from one to another of the species that we know. But, supposing that as our knowledge increased we were to find no trace of this—were to find the forms of life persistently grouping themselves around distinct centres, instead of arranging themselves in a linear chain—we should have a weighty argument against the hypothesis in whose favour the story of the rocks is invoked as a witness. Something like this it is which occurs in considering, with increased knowledge of facts, the various points of the argument whereon Darwinism rests.

It should not be forgotten that the various points of natural history which Mr. Darwin and other observers have established, are in themselves as separate and distinct one from another as are the various species of animals and plants which we behold, and that their connexion in one whole, as Darwinians connect them, is as yet just as much a matter of hypothesis as is the connexion of those species by intermediate links. It has been shown, for instance, that there is a perpetual struggle for existence among the various inhabitants of the organic world: it has been shown that the individuals of a species tend to vary, more or less, from the normal type: also that man can avail himself of these variations to modify the qualities of the animals

in his herds and the plants in his gardens. This has been proved. But that variation, trimmed and pruned by the struggle for existence, has modified species in a state of nature, as has man's conscious selection in a state of domestication—this is as yet but hypothesis, and hypothesis which needs confirmation from fuller inquiry into the facts of the case, just as much as the other hypothesis of the continuity of forms between one species and another. As we learn more about the struggle for existence, and about the variability of species, though more fully establishing these as separate verities, we may possibly find that they do not play into each other's hands as they have been assumed to do, just as fresh observations of the path of a comet may show it to be not an ellipse, but a parabola—not re-entrant, but divergent.

Mr. Wallace has some important modifications to make in the statement of the observed facts with regard to variability, as known to Mr. Darwin. In the *Origin of Species*, the variations on which Natural Selection has had to work are always represented as *slight*. It is in "the accumulation of innumerable slight variations, each good for the individual possessor," that Mr. Darwin finds the means by which organs and instincts have been perfected:[1] all organs and instincts are, he tells us, "in ever so slight a degree, variable:"[2] there must have been "an interminable number of intermediate forms,"[3] "an infinitude of connecting links,"[4] between species and species. So undeniable, indeed, is this, that a frequent objection to the Darwinian theory has been the impotence of variations so minute, as was supposed, to benefit in any practical degree the creatures in which they occur.

Mr. Wallace, however, shows that the differences which are constantly found to exist between individuals of the same species are by no means slight. In his own words,[5] "Individual variability is a general character of all common and widespread

[1] *Origin of Species*, c. xiv. p. 459. (fifth thousand.) [2] *Ibid.*
[3] *Ibid.* p. 460. [4] *Ibid.* p. 461. [5] *Darwinism*, p. 81. Italics mine.

species of animals or plants: this variability extends, so far as we know, to every part and organ, whether external or internal, as well as to every mental faculty. Yet more important is the fact that each part or organ varies to a considerable extent independently of other parts. Again, the variation which occurs is very large in amount—*usually* reaching ten or twenty, and sometimes even twenty-five per cent. of the average size of the varying part; while not one or two only, but from five to ten per cent. of the specimens examined exhibit nearly as large an amount of variation." The proofs brought in support of these assertions are overwhelming. Among the lowest foraminifera, amongst sea-anemones, mollusks, insects, reptiles, birds, and mammals, abundant instances are quoted. It will perhaps be sufficient to take one or two examples.

Amongst fourteen specimens of the wall-lizard (*Lacerta muralis*) examined by Mr. Milne Edwards, no single character except the scales on the head was found to be constant, the neck, trunk, tail, legs, and colour all "varying wonderfully," as shown by a diagram which Mr. Wallace appends.[1] Fifty-eight specimens of the cardinal bird (*Cardinalis virginianus*) yielded scarcely a single one in which any of the more notable features corresponded exactly with the normal type of the species. In regard of the tail, for instance, three at most could be said to have it of about the regulation length, twenty-four having it shorter, and thirty having it longer: but the extremes of variation were in the direction of defect rather than of excess, four specimens having their tails very short and only one very long. In the total length of the birds themselves, the discrepancies were still more remarkable, no one individual making any pretence to conform exactly to the stock pattern. They generally inclined to be larger rather than smaller, but instances of excessive variation were again somewhat in the other direction. The same sort of thing is to be seen in the length of their

[1] p. 65.

wings, and the bill, the tarsus, the toes, are all found in this and other species to show an equal disregard of law. So amongst quadrupeds; one squirrel varies somewhat from another, within the limits of the same species,[1] as to the length of the head, a great deal as to the length of the feet, and extraordinarily as to the body, and especially as to the tail. In the same species of wolf and of bear,[2] extraordinary differences are found as to the several proportions of the skull—its length, its width, the sizes of the orbits, the palate, the nose, and the jaw-bone.

These are, I repeat, but specimens, taken from the mass of evidence produced by Mr. Wallace, and no one who examines that evidence as a whole can fail to see that he has established his case. The variations of form and structure which occur among wild animals—and the same is to be said for plants—are not occasional and minute, but incessant and important. There is clearly an end of the objection, above referred to, based on the supposed infinitesimal character of variations.

Very little reflection is, however, needed to show that if one difficulty is removed, it is only by introducing another vastly more formidable. If individuals are perpetually varying in such a fashion as we have seen, how comes it that species do not, like them, vary under our eyes? If every organ and function in each concrete specimen that we meet tends to depart from the normal type, how is it that the type remains normal, and that these variations persistently arrange themselves about it? The deflections and nutations of a planet prove the existence of the force which in spite of them prescribes a fixed path and position, and unless the minor members of a solar system tended, of their own momentum, to fly off into space, we should not know that there was an overmastering power anchoring them to one centre. In the case which we are considering, the persistence of uniformity amid continual variation is

[1] *Sciurus carolinensis* is Mr. Wallace's example, p. 67.
[2] *Canis lupus* and *Ursus labiatus*, pp. 70—72.

far more remarkable. Each of these variations is a handle, and a powerful one, for Natural Selection to grasp, and so to modify subsequent development. If the centrifugal tendency, which such variability indicates, were all—every varying climate and soil and circumstance on the face of the globe should make its own species, or rather there should be no species at all, but a fleeting and evanescent succession of individual forms, like the shapes of clouds in a windy sky. It is idle to pretend that the features which any species constantly exhibits are specially adapted to existing circumstances, for in no two habitats are existing circumstances the same. To take examples familiar to every one: The house sparrow[1] flourishes in the north within the Arctic Circle, and on the Albert Nyanza, close to the Equator, in Siberia, and in Madeira, the Faröe Islands, and Moscow. Our common water-crowfoot, whose white blossoms float on pools or sluggish streams, is to be found in all temperate regions, north and south, except New Zealand and the Pacific.[2] Now, who can say that in either of these instances, which might be reinforced by a host of others, the conditions of existence are so precisely the same for the species as a whole as to stereotype its characteristics—to perpetuate among sparrows, for instance, a white streak over each eye, a black lore, and a bar of white on the middle wing-coverts? It must be remembered that unless such absolute uniformity of type were everywhere visible, systematic naturalists would be only too glad to pronounce that the species were different: it is only the clearest evidence of continuous similarity, down to the minutest details, that can hinder them from doing so. And what is the force, we may ask once again, that preserves this uniformity, amid continual false starts along other paths? What hinders their varying

[1] *Passer domesticus.* See Howard Saunders' *Manual of British Birds*, p. 171.

[2] See Sir J. D. Hooker, *Student's Flora of the British Isles*, p. 5.

surroundings from fashioning individual variations into permanent varieties?

It would therefore appear that the new crop of facts gathered by Mr. Wallace, while establishing on a broader basis than before the truth of variation, does not at the same time serve to establish the variability of species through Natural Selection, but, on the contrary, brings into more prominence than ever the idea of a controlling force strong enough to draw things together which circumstances would naturally drive apart. Instead of a fresh link being added to the chain of argument yoking together variability and struggle for existence as joint factors in the work of development, a link is snapped which we fancied to be forged. With infinitesimal variations, developments might be going on before our eyes, and yet be as invisible to us as the movements of the shadow on the dial. But with such variations as are now established, development, on Darwinian principles, should proceed at a rate at which we see that, in fact, it is not proceeding.

Therefore, just as we might find from a fuller investigation of the rocks evidence for the isolation, and not for the concatenation, of the various forms under which life is known, so do we find like evidence from a more complete understanding of the state of the case with regard to variability. The forms tend persistently to group themselves round types, which yet remain ideals never, perhaps, actually realized in any concrete instance, and whose continuance cannot therefore be well explained by what we are accustomed to call heredity.

The above considerations may assist us to a clearer conception of what we mean by a *species*. Every one uses the term, and every one knows what is meant; yet none ever succeeds in a satisfactory definition. Mr. Darwin seems to imply[1] that no definition can be framed without including "the unknown element of a distinct act of creation." De Candolle[2] defines

[1] *Origin of Species*, p. 44.
[2] Quoted by Mr. Wallace, *Darwinism*, p. 1.

it as a collection of individuals which resemble one another more than they resemble anything else, which hand on their peculiarities from generation to generation, and which, from analogy, we suppose to have sprung from one individual. Swainson,[1] still more awkwardly, defines a species as an animal which, in a state of nature, is distinguished by certain peculiarities from another animal, and propagates after its kind; whose peculiarities, therefore, are permanent. It would seem to be simpler and plainer to say, that a species is a permanent group of plants or animals framed in all particulars after a single type. This emphasizes the most remarkable fact about species, the fact, namely, that in all cases, man alone excepted, we can describe a species very much as an individual. Not only as to bodily qualities can we say that the cock-sparrows born next season will have narrow white streaks over their eyes, but we can securely beforehand set down the whole brood, cocks and hens alike, as impudent, quarrelsome and thievish, and addicted, despite all experience, to building nests in water-pipes. We can describe the fox as cunning, the booby as stupid, the robin as familiar, the tom-tit as plucky. We may set traps openly on the tops of bare poles, knowing that hawks will infallibly perch upon them, and circumvent the more astute crow by poisoning eggs which he will with equal certainty eat. We know exactly the habits of mind which will induce the wild-duck to enter our decoys, and the wheat-ear our traps. We know that a trout when hooked will behave in one way and a salmon in another; we talk of one fish as game, and of another as faint-hearted. Red ants, we prophesy, will make slaves, and black ants submit to slavery; moths will fly into candles; jackdaws will run off with anything that glitters; dogs will attach themselves to masters. The characteristics of each race may vary in what seems the most arbitrary manner, and yet be obviously for that race the rule which they follow by no inde-

[1] *Darwinism*, p. 2.

pendent volition of their own; in spite of the argument by which the cat in the fairy-tale proved its own madness, "A dog isn't mad, is he? Well, he growls when he is angry, and wags his tail when he is pleased: but I growl when I am pleased, and wag my tail when I am angry."

The description which naturalists give of species descend to particulars still more minute than these; and generation after generation we find these descriptions verified. The component individuals are all obviously made after one pattern, like the uniforms of the same regiment. Species are thus the ultimate moulds in which nature casts her organic products; the terminal buds on her genealogical tree. It is extraordinary how near one species may run to another, remaining at the same time fundamentally distinct. An excellent example is afforded by two of our commonest summer migrants, the willow-wren and the chiff-chaff. When once they open their mouths to sing there is no mistaking them; but till they do that it is almost impossible to distinguish them. Even when we hold them in our hands, except for a slight difference in their size and in the colour of their legs,[1] we find no apparent distinction. The surest test is found in the quill feathers of the wing. In the willow-wren the second quill is equal in length to the sixth, in the chiff-chaff to the seventh; in the former only six quills and in the latter seven have the outer webs sloped off or emarginated. In habits the two species are as like each other as in form. They live on the same food, build most similar nests, and lay eggs similarly marked, though with slightly different colours. Yet running so very close to each other, they are as distinct as species can be. As already said, their song is utterly distinct, the one emitting a cheerful though very simple strain from a bush, while the other seated aloft in a tree hammers away persis-

[1] The length of the willow-wren is 4·9 inches, and of the chiff-chaff 4·75: the legs of the former are light brown, of the latter dark brown.

tently at a couple of notes, or as it seems to all but the most delicate ears, at one note only. The points of difference which we can specify between the two are slight and seemingly trivial, but for all that it is perfectly clear that a willow-wren is one thing and a chiff-chaff quite another; they go each their own way in absolute independence, and very often do not inhabit the same districts. There is something which discriminates them, beyond any point of difference on which we can put our finger; they rally round different standards, and obey different watchwords.

From what has been said it would appear that the most striking characteristic presented by species, as we know them, is their isolation one from another. It is most important to bear this constantly in mind when considering any theory which professes to explain how they are linked together. On Darwinian principles we have to hold that any two species may ultimately be traced back to a common form, from which both have sprung, just as the buds of a tree, whereto I have compared them, may be traced back to the same bough, or at least to the same stem. But, more than that, we have to maintain that these buds, fraught with the potency of yet further developments, have come to be where they are, not through any innate laws of growth within the tree which bears them, but simply through the mechanical operation of external forces. According to this view, Nature's genealogical tree differs from other trees in having no predisposition stamping its growth with any particular character; it will be an oak, a palm, or a bramble, as circumstances choose. Therefore, when we lay down that the one species, or genus, or family, has sprung from another, not only must we assume that every form intermediate between the two has once existed, we must also postulate that the conditions of the earth have been such that each intermediate form has in its own time been the most advantageous in the struggle for existence.

Birds, for example, we are told have descended

from reptiles, whose fore-legs have been developed into wings, and their scales into feathers. If we are good Darwinians, not only must we hold that the bird-form is the best for one set of conditions, and the reptilian for another; we must suppose that a form half-way between the two, with legs half-wings and scales half-feathers, was once upon a time better for those creatures who fell in for it, than the old reptile-form which they had left. According to this theory, no advance is made along the path of development in view of any point to be gained beyond. If any single step is taken, it is because the position gained is good in itself, better for those who occupy it than the situation they have left, and enabling them to fight for life on better terms than those who have stayed behind. It is like saying that the only way in which men could have got from London to York was by building a town all the way; each fresh suburb and street and house being added, merely because it was good for man to be *there*, because the situation afforded advantages unknown before. And just as in the map of England there are wide tracts where no trace of a hamlet or a hut speaks of human occupancy, and where no feature of the district suggests any motive that could make men dwell there, so in the scheme of organic life, as known to us, there are wide gaps, which it baffles our very imagination to fill. We can fancy, easily enough, that all the conditions of the globe, that we witness, have been changed for their contraries—tropic heat for arctic cold, land for water, loam for rock. We know what other changes would be involved by these in the world of life, for in our flora and fauna we have abundant instances of forms adapted to all. But for such creatures as those which we have to suppose, it would seem that another sort of world was needed, and other rules of the game of life, of the existence of which we have no evidence at all beyond our own speculations. It is not merely that links are missing in the chain of life-forms; they are missing just where they ought to be found, if we

are to be justified in talking of the evidence afforded by observation in favour of the Darwinian theory.

The difficulty thus arising has, it is true, been to some extent anticipated by Mr. Darwin himself, who attempts to supply an answer. It would, however, seem that there are important factors in the problem which his solution does not consider. His contention is that if we do not find link-species actually existing, it is because they have been beaten in the race of life by their more developed descendants; and if we have not found them in the rocks, it is because of the extreme imperfection of our geological record.

As to the first point of this argument, he bids us remember that we must not look to find forms indicating the direct descent of one of our existing species from another. The birds, for example, of the present day, are not to be traced to any of our living lizards, but bird and lizard alike to a common ancestor, more lizard-like than bird-like. From this unknown progenitor the fowls of the air have branched off in one direction, utterly modifying the ancestral organs, and our creeping things in another, still applying the organs to their original purposes, but improving their structure variously for the same. Therefore, he argues, the more modified species, in whatever direction their modifications may have lain, have improved their position in life, relatively to the original, which they have consequently exterminated; just as the rifle-man has extinguished the arquebusier and the arquebusier the crossbow-man. "Hence," in his own words,[1] "if we look at each species as descended from some other unknown form, both the parent and the transitional varieties will generally have been exterminated by the very process of formation and perfection of the new form."

The non-existence of intermediate forms as living species being thus accounted for, it remains to explain why they are not found as fossils. As Mr. Darwin puts it,[2] "Why is not every geological formation and every stratum full of such intermediate

[1] *Origin of Species*, p. 72. [2] *Ibid.* p. 280.

links? Geology assuredly does not reveal any such finely graduated organic chain; and this, perhaps, is the most obvious and gravest objection which can be urged against my theory. The explanation lies, as I believe, in the extreme imperfection of the geological record." How imperfect our knowledge of that record is, he proceeds to show. Only here and there on the earth's surface have we the opportunity of getting a glimpse into the volume whose pages are the rocks. A water-worn cliff, a mine, a quarry, a railway-cutting, show us here and there the fragment of a leaf; but how insignificant a portion of the globe's face is scarred by any of these. What we know of the geological record must, from the nature of the case, be to what we do not know as a minute and altogether insignificant fraction. The fact, therefore, that we know little or nothing of intermediate links, is not surprising but natural, and till our knowledge of the whole be vastly greater than it is, we can found no argument upon our ignorance of a part.

Rightly to understand the complex bearings of a line of reasoning such as this is no easy task, and he would be a bold man who could pretend with any confidence to grasp them all; but assuredly there are some obvious considerations, not indicated by Mr. Darwin, whereof account must be taken, before we can draw from his premisses the conclusion he would have us adopt.

In the first place, it must not be forgotten that in any direct line of descent, such as he supposes, amongst successive species of plants or animals, although each generation is better fitted for the struggle of life than its predecessor, it does not therefore follow that the tide of life on earth has continuously increased in volume, as do the waters of a river from its head to its mouth. The less developed had to contend with less developed antagonists, and were just as capable of establishing a firm and durable empire as were the ancient Romans, though they knew nothing of gunpowder.

Life must, at all times, have been coextensive with the capability of the earth to support life, and there is no reason whatever to suppose that this has developed as time went on, for while one class of creatures have been modifying themselves more effectually to consume others, those others have, by the same rule, been guarding themselves against being too easily consumed. The stream of life must therefore be taken as constant at all periods and in all stages of development, on the border lines between our present forms, just as much as within the tracts that include them.

It must, moreover, be remembered that the Darwinian theory, though commonly spoken of as dealing with the origin of *species*, claims equally to deal with the origin of more primary and fundamental divisions in the organic world, of genera, orders, classes, and even kingdoms.[1] On its principles we have to assume that the procession of life-forms has been continuous, from the least organized jellies of the primitive world, to the most complex structures of our own. As has been said, every step of the road must once upon a time have been occupied in force, one as much as another, and occupied during the enormous periods of time needed for development to be wrought. All the border-lands between our existing forms must once have been thronged with life, if one class of creatures has grown out of another. It should therefore seem that the classification of extinct organisms ought not in any degree to coincide with that of those which are living. Granting that the latter have been developed into strongly-marked differences, yet in the series which led up to these we should find

[1] The organic world is divided into the *vegetable* and *animal* KINGDOMS. The latter is divided into two SUB-KINGDOMS, *vertebrates* (back-boned animals) and *invertebrates*. *Vertebrates* have five CLASSES, *fish*, *amphibians*, *reptiles*, *birds*, and *mammals*. Each of these has various ORDERS, as, amongst birds, *swimmers*, *waders*, *runners*, *scratchers*, *climbers*, *perchers*, *birds of prey*. Within each ORDER are FAMILIES, as the *sparrow family*, among the *perchers*. The GENUS *Passer*, a subdivision of this, includes various SPECIES, as the house sparrow and the tree sparrow.

such differences melt away. The diagram of extinct life should be to that of existing life as a continent to an archipelago. More than this: we have actually good reasons for anticipating that, if Darwinian principles were true, we should find more traces of those forms which have no near counterpart in actual life, than of others. The more fundamental a development has been, the more time must have been needed to work it. Any species, therefore, in which such development has been operated, must have been long-lived and multitudinous, in exact proportion to the importance of differences which separate those between which it constitutes a link. For example, whatever space of time may have been required to evolve the features which distinguish one bird from another, a goose from a humming-bird, an immeasurably larger space must have been needed to make a true bird out of a true reptile, and countless myriads of creatures must have lived and died in a condition between the two. But the most notable fact about the record, as we know it, of geology, is its harmony with the broader features of the existing order of things. Mammals we find, and birds, reptiles, fishes, insects, mollusks. They do not fit in, it is true, with our actual genera and species, but there is no doubt as to where to place them in our larger classes. Instead of manifesting a character completely at variance with our present classification, with its broad intersecting gulfs separating forms from forms, the geological record adopts that classification, lending itself with singular facility to its arrangements—gulfs and all. Therefore, although it be true that we know but little of that record, yet what we do know points all in one direction.

Still more notable is it that what might seem at first sight to be possible links, present us with some of the most perplexing problems. For instance, to keep to our example, there have been flying reptiles,[1] and there has, at about the same period of the world's history, been a bird with sundry reptilian

[1] Pterodactyles.

features.[1] Some writers have hastened to declare that this at once proves the case for the descent of the one from the other. But in the first place the pterodactyle, although he could fly, was as clearly a reptile as the bat is a mammal; and although the archæopteryx had lizard-like teeth, a long tail, and free digits on his wing, no one can read Professor Owen's account[2] without seeing that he was as true a bird as the canary. But, moreover, whatever else these species may be, they cannot be links in the same chain of development. The pterodactyle had a wing, to be sure, but it was a wing constructed on utterly different principles from that of a bird. In it the little finger of the hand[3] is abnormally developed, and, with the aid of a membrane, performs all the work of flight. In the bird this digit is suppressed altogether, and a totally different modification of parts exhibited. The archæopteryx has a bird's wing, and a completely developed wing too; the proportions of some of the more important parts are, according to Professor Owen, like those of the peregrine falcon, while as a whole he compares it to the wing of a grouse. And yet it is not even this member which, on the same authority, most evidently stamps the creature with the character of a bird, but its breast-bone, and especially its feet.

Instead, therefore, of filling the void, such an instance as this does but serve to emphasize its existence. Reptiles we see might have come to fly as well as birds, and yet be as far from being birds as the crocodile, or rather still further, for it would be easier to make a bird's wing out of a crocodile's fore-foot than from the wing of a pterodactyle.

Once more then, by another road, we are brought

[1] The *Archæopteryx* of the oolite.

[2] *Phil. Trans. Royal Society*, for 1863, pp. 33, seq.

[3] It is scarcely necessary to observe that in the skeleton of all vertebrate animals the same fundamental parts are to be traced: thus the hand of man, the wing of the bat or the bird, the flipper of the whale, the paw of the lion, the fore-foot of the lizard, all contain the same ultimate elements, variously modified according to the creature's various needs.

back to the consideration with which we started, that the most striking feature presented to us by these various tribes of organic creatures which we know, is their isolation one from another, far more than their intercommunion. Everywhere we seem to find evidence of forces working actively from within, and determining the fundamental character of each class, and not of a mere passive plasticity ready to assume any form which surrounding circumstances may impress. Yet it is for this colourless passivity that Darwinians argue. In Mr. Wallace's words: "In this way [by preservation of variations happening to prove useful] every possible modification of an animal or plant, whether in colour, form, structure, or habits, which would be serviceable to it or to its progeny at any period of its existence, may be readily brought about."[1] More noteworthy still are his words that follow: "There are some curious organs which are used only once in a creature's life, but which are yet essential to its existence, and thus *have very much the appearance of design by an intelligent designer*," an appearance which he clearly holds to be illusory, for he proceeds to explain how Natural Selection can sufficiently account for all the facts. Here we may clearly see the distinction to be drawn between a theory which teaches merely that there has been development in the history of the organic world, and one which lays down that the development has been operated by the agency of Natural Selection alone. For those who hold development to have proceeded on a plan and along fixed lines, the difficulties urged above are not formidable. A man intending to reach a distant spot does not embark on a railway with the intention of spending his life thereon, but as a means to his destination. The idea of a foreknown end once introduced, there is no necessity of holding that every step along the road was once a terminus. But take such an end away, and it is hard to understand how the ground-plan of nature, as it has in fact

[1] *Darwinism*, p. 113. Italics mine.

resulted, should be distinctly traceable in every phase of its past history.

To recapitulate. The constant variability of individuals within the same species, while the specific type endures unvaryingly, points to an energetic intrinsic force, as the operative agency by which species are moulded, and discredits the idea that their forms are the sport of extrinsic conditions. On the latter supposition there would be required, in order to account for the development of one class of creatures from another, a chain of conditions rendering each intermediate form, in its season, the most advantageous hitherto acquired by any organism in that line of development. Some of the conditions, thus postulated, must have been so alien to all now existing upon earth, that the advent of the present state of things has utterly obliterated the races which existed therein, as effectually as an atmosphere of choke-damp would extinguish our present fauna. Moreover, the creatures thus exterminated, though they must have been once found in as large numbers as those of other periods, have melted away like a wreath of mist, leaving no trace behind, and thus enabling the series of life-forms exhibited by the rocks to tally with our own, as to both its contents and its gaps.

Travellers tell us of hosts of ants which in their migrations overcome all obstacles by lavish sacrifice of lives, filling up pits and damming streams and even extinguishing fires by the sheer force of numbers, willing to perish that others may find a path over their remains. Were we to track their course to confirm such an account, we should look to find their remains most plentiful where their difficulties have been greatest. So should it be, on Natural Selection principles, with the march of life. There, too, there are chasms to be filled on the way, if that way is to be continuous from end to end. The passage from invertebrate to vertebrate, from fish to reptile, from reptile to bird or to mammal, demands changes so fundamental that the earth should be

laden with the failures. But it is just where the dead should be lying thickest that we find them not at all.

There is yet another quarter where our missing links may be sought. The history of the development of each individual animal, as we are often told by Darwinians, is a summary of the history of the race to which that individual belongs. A mollusk, for instance, a reptile, a bird, and a mammal, have their origin in primitive cells absolutely similar, and in the course of its progress towards what is to be its final form, the reptile is at one period indistinguishable from a fish, and the mammal from a reptile. "A better proof of this," says Mr. Darwin,[1] "cannot be given than a circumstance mentioned by Agassiz, namely, that having forgotten to ticket the embryo of some vertebrate animal, he cannot now tell whether it be that of a mammal, bird, or reptile."

The fact is certainly important and significant, but it is hard to see in it a proof of what Darwinians would have it prove.

In the first place, as has been well pointed out by Mr. Mivart,[2] though, in some cases of individual development, there be progress from one form to another, that progress is ruled by a force intrinsic to the developing creature, and not by extrinsic circumstances. The future dog may for a time be indistinguishable from a lizard, but a lizard it is not, and nothing on earth can make it one, or can even change it to a wolf. A dog it must be or nothing. "If then," argues this able writer, "the development of the individual is an epitome of that of the species, the latter must, like the former, be due to the action of definite innate laws, unconsciously carrying out definite pre-ordained ends and purposes."

For our present object it is still more noteworthy that the abridgement of evolutionary history thus presented by the embryo, is as silent on the subject of the link-forms whereof we are in search, as are the voluminous tomes of the rocks. We obtain no

[1] *Origin of Species*, p. 439.

[2] Articles in the *Tablet* newspaper, March to June, 1888.

hint at all as to how one class or order of beings can have been changed to another, but again seem to recognize life in all its stages as being attached to one or other of the typical forms to which we are accustomed.

But more than this. In some of the lower animals the processes of individual development are displayed nakedly before our eyes, like the works of a skeleton clock. In the class of insects, for example, we see in the larva a totally different life-form from that of a perfect insect. A caterpillar differs from a butterfly, not so much indeed as a lizard from a bird, but yet sufficiently to make it instructive to observe by what kind of form he links these two phases of his existence. He does so by becoming a chrysalis. Did any caterpillar ever go into the chrysalis unless with the purpose of coming out as a butterfly? If the intermediate form were ever his final stage he might as well, so far as his individual development was concerned, have gone into his coffin or into the crop of a sparrow. Here then, at least, is a form such as we have sought, connecting conditions of existence altogether different, but it is a form which can never have been the terminus of development, for in that case the terminus would have been final.

However, therefore, we approach the problem, the solution offered by Darwinianism appears less satisfactory the more it be examined. Intrinsic forces working definitely towards one plan, not indeterminate forces swept hither and thither by external agencies like a cloud of dust, are suggested by the phenomena of nature, whithersoever our eyes are turned. It would be strange were it otherwise. Organic nature in all its parts we find to be inexorably ruled by law. How then shall we expect that with the whole it should be otherwise? Lawless or really random variation, says Dr. Asa Gray,[1] would be a strange anomaly in this world of law, and a singular conclusion to be reached by those who insist upon the universality of law in Nature.

[1] *Contemporary Review*, April, 1882, p. 609.

The Game of Speculation.

HALF an hour's walk by our neighbouring river will be sure to afford us a chance of seeing a water-ousel, a sight which, in spite of its local familiarity, would seem to be, for naturalists, somewhat of a privilege. Mr. Yarrell, who did so much for British ornithology, is fain to acknowledge that he must depend for his account of the habits of the bird on the testimony of others, having never had the opportunity of watching it himself; while, still more strangely, such a companion of Nature as Mr. Ruskin regretfully declares:[1] "I am sixty-two, and have passed as much time out of these years by torrent-sides as most people. But I have never seen a water-ousel alive."

To the angler who has wandered among north-country streams, the idea that the ousel can anywhere be rare will come with a shock of surprise, for he must have found it at every turn haunting his steps as though it were the familiar genius of his craft. Indeed, it would rather seem as if those who have once been properly introduced cannot shake off its company. I know, for my own part, that up among the Carpathians, on the Bialy Dunajecs, one of the head waters of the Vistula, though the region was almost birdless, and though what birds there were were mostly unfamiliar, while by the waterside grey-headed wagtails and green sandpipers replaced our English friends, the water-ousel stuck by me, as though his presence by a trout-stream was a matter of course.

[1] *Love's Meinie*, p. 99.

But, however that may be, he is to be found any day we choose to look for him here upon the Hodder. Every reach of the river contains a pair, and as they never leave the river-bed we have but to walk along the bank and watch. Presently, with something of the equable velocity of a bumble-bee, not very high above the stream, and faithfully tracking its windings, a bird scuds past, a bird wearing a very white waistcoat, and, seemingly,[1] a very black coat. Perhaps, instead of this, we first catch sight of him perched on a stone, in mid-stream by preference, dropping a series of incessant curtseys to the universe at large; or, again, our first notification of his neighbourhood may be a tinkling silvery trill, heard through the rush of waters, something like the song of the wren, and, like that strain and the redbreast's, gracing autumn as well as spring.

The bird thus recognizable is the water-ousel, otherwise the dipper, and, if we pay a little attention to his movements, we shall have no difficulty in understanding how he comes by this other name. Though, as we have seen, he flies well, he obviously does not feed on the wing, and when in search of food he imitates in his manœuvres none of the birds we are accustomed to see. He does not hop like the robin, and though he will run the length of the stone on which he is, he does not like the wagtail patter up and down the shore-line in quest of prey. Not the surface or edges of the stream, but the bottom, is his hunting-ground, and to it at no long intervals down he goes. Ever and anon, we can hardly mark how, he is gone from the stone where we saw him, disappearing in the water like a bubble that bursts or a may-fly sucked down by a trout. Presently he is out again, on the same stone or another, but the chances are that we discover him there, without

[1] Seen even from a short distance the ousel appears to be entirely black and white, and hence his local names of "water-piet" and "water-crow." In reality the head and nape are chestnut, and the plumage elsewhere is of a much less decided black than we should be inclined to think.

being able to notice how he arrives, as though he had been shot into vision as he melted out of it. Sometimes from the wing he will plump into a tumbling stream, going down in it as if made of lead, and after a time he is on the surface as buoyant as a cork, and then sinks again without the apparent effort of a diving-bird, simply ducking his head and vanishing. At other times he works in shallow water with only his back above the surface, finding, as it seems, no difficulty in keeping himself submerged, raising his head and lowering it again to forage at the bottom, as he moves. How he performs these feats no one appears to know with certainty. The first bird-book I read as a child declared that the dipper takes down with him a supply of air under his wings, on which to subsist while beneath the surface; but this ingenious notion mistakes the nature of the problem. The difficulty is to explain how a bird so light contrives to reach the bottom and to stay there, even though he does not buoy himself up like a balloon. There are authorities who declare that, by some mysterious law, the ousel is able to walk about at his ease on the bottom, as other birds on land, which idea is somewhat countenanced by his conduct in shallows, as above described.

Others deny him this power of walking under water, and declare that he progresses there by flying, as we may see guillemots in aquarium tanks, using no organ but his wings; while, according to a third account, he struggles with all his might, his head and body protruded, clutching at stones with his feet, and working his wings "with considerable exertion and apparent difficulty, quite unlike the comparatively facile movements of a coot or cormorant, or any bird of similar specific gravity." An account of the matter, compounded of these two, is suggested by the case of the young ousels, to be quoted presently.

But however the feat be performed, one thing is certain—the bird is not carried away with the stream, for he will work backwards and forwards, with perfect unconcern, across a tumbling rapid. He

goes down, of course, in quest of food, but as to the precise nature of that food the testimonies, again, are not in full accord. Mollusks and the larvæ of insects he certainly devours, but what about fish? Macgillivray bears witness that, having dissected many dippers, he never found a trace of either fish or spawn, and to the same effect speaks the author of *Autumns on the Spey*. On the other hand, I am assured by an observer of first-rate accuracy that, though the birds will not themselves eat fish, he has seen minnows brought by the parents to their young, when being rejected by them they dropped upon a heap which lay beneath the nest in various stages of decay. Finally, yet another naturalist tells me that he has watched a dipper catching and killing minnows in a brook, and this in autumn when there were no nestlings to whom they might be offered.[1]

The nest is in keeping with the bird's habits, being built hard by the waterside, on the face of a rock, on the pier of a bridge, under an arch, or even sometimes, it is said, on a dry spot behind a waterfall, so that the parent bird has to go in and out, and the young catch their first glimpse of the world at large

[1] To the above historic doubts may be added another. In nearly all the illustrations accompanying ornithological works, the dipper is represented as tilting up his tail, after the manner of a wren. In Yarrell's *British Birds* he is made to hold it almost at right angles to his body, like a turkey-cock. In Johns' *British Birds in their Haunts*, Selby's *British Birds*, and the Duke of Argyll's *Unity of Nature*, the figure presented is of what the author of *Sylvan Folk* happily describes as a "crescented form." Such a posture, I am convinced, is by no means normal with the bird: he assumes it for a moment immediately on emerging from the water; but as a general rule he sits with tail horizontal or even slightly drooping—certainly he does not sing in the other position, as Johns makes him. A general impression of the jerkiness of his movements seems to have caused this mistake. It is a curious fact that birds do not appear to recognize their enemy Man when he approaches them by swimming. I have known a wagtail attempt to settle on my head, and afterwards, perched on a rock in a deep pool, it allowed me to put my face within a foot of its position. Watching a dipper in similar fashion, at a distance of three or four yards, I particularly noted that its tail was carried perfectly horizontal.

through a curtain of rushing water. The nest is domed, like that of the wren, and is most artistically assimilated to its surroundings, being likewise carefully felted to make it waterproof. The young, as befits their situations, long before they have left the nest understand that the water is their safest refuge, and how best to make use of it. A young naturalist friend of mine furnishes the following interesting description:[1] "I lately took some young water-ousels, barely fledged, out of their nest, and placed them in the stream over which it was built. Though they had never been in the water before, they dived immediately, and, swimming a considerable distance beneath the surface, took refuge close to the opposite bank, crouching behind the stones and overhanging grass, with their heads out of the water. They afterwards swam with great facility, both with and against the current, which was very strong. In swimming they made use of the full extent of their wings as well as their legs, and always descended and rose to the surface in an oblique direction. I then placed them carefully back in their nest, and after leaving a handkerchief at the entrance for a short time, that they might settle down till the parent birds should return, I left them apparently none the worse for their early bath."[2]

[1] *Stonyhurst Magazine*, vol. i. p. 24. I am informed that the experiment has lately been tried of putting a starling's egg in a water-ousel's nest. It was duly hatched, but on the third day after, the parent birds, terrified by the uncouth cries of the strange nestling, deserted the whole brood.

[2] Since this was written I have myself had an opportunity of observing a young dipper in the water. This was a half-fledged nestling, the quills on the wings just beginning to develope, which accidentally fell from its nest on an overhanging branch into a very boisterous rapid. Swimming and diving, it contrived to evade the main current with wonderful dexterity, and attempted to climb a rock on its margin, but this was steep and slippery, and before assistance could be brought the bird was carried away, and swept over a small waterfall, entirely disappearing beneath the current. A few yards down, however, it came to the surface and struck out vigorously for the shore, where I rescued it and dried it, then leaving it apparently hale and hearty in the nest again.

The water-ousel is thus stamped in the family of birds with an individuality not only notable but unique, uniting in his single self the most extraordinary contradictions—"a water-bird that sings, a song-bird that swims and dives."[1] For though in his habits more truly aquatic than a duck—though he lives above the waters, except when getting his living below them, though waters to please his taste must be turbulent and brawling, so that, turning his back on placid low-country streams, he elects to dwell on rivers that foam over rocks, and burns that leap from the sides of hills—yet, but for the fact that he is what he is, he has no right, that naturalists can discover, to be called a water-bird at all: none of the classifications which they can make will bring him into relationship with any birds but those that most distinctively belong to the land: no single feature of his structure would give a closet-naturalist any hint of the kind of life he leads. "The acutest observer," says Mr. Darwin,[2] "by examining the dead body would never have suspected its sub-aquatic habits."

The dipper, in fact, according to most naturalists, is a species of thrush, or a link between that family and the flycatchers.[3] He has the feet of a thrush,

[1] Johns' *British Birds in their Haunts*, p. 72.

[2] *Origin of Species*, p. 185 (fifth edit.).

[3] The newest classification, however, that adopted by the British Ornithologist's Union, has in this, as in other cases, upset pre-existing arrangements. According to the new system, the dipper stands amongst British birds between the hedge-sparrow and the titmice. This change, as is obvious, does nothing to explain the problems suggested by his economy, but rather adds several perplexing elements thereto. In support of his account of the development of the dipper from the same stock as the thrush, Mr. Wallace quotes the fact that the American water-thrushes (*Seiurus*) wade in water, and often plunge head and neck beneath the surface, though their plumage is still pervious to water. But if the new classification be the right one, we have to suppose that dippers and thrushes parted company before either had acquired the characteristics now observable. In fact, whichever way we decide to class them, a puzzle confronts us. If the dipper be next-of-kin to the tits, how came he, leading so utterly different a life, to evolve characters which have made naturalists rank him as a thrush? and if he be a thrush, whence come his tit-like characters?

with no trace of a web, the bill of a thrush, and the plumage of a thrush. Yet his foot never perches on a tree, and a minute's immersion would reduce a thrush's feathers to a condition of bedraggled uselessness.[1]

Here, therefore, we have a problem presented to us of which account must be taken by any theory which deals with the origin of species. If the water-ousel be really a development from the same stock whence spring the thrush, the blackbird, and the fieldfare, what has been the agency which has availed to make him as unlike them all as one bird can be to another? For, after all, it is not the frame of bones, muscles, and nerves that constitutes a creature's essential character, but the mysterious force which energizes through them. The dipper's thrush-like features no more make him a thrush than likeness of face and gait showed Major Pendennis to be of the same stuff as the Duke of Wellington. The problem is so notable that such a theory as the Darwinian must needs take account of it, and in studying that account we have an opportunity of studying in the best possible form—that is to say, in a concrete instance—the sort of explanation in which that theory deals.

Mr. Wallace, in his recent work,[2] thus handles the question: "Here then we have a bird, which, in its whole structure, shows a close affinity to the smaller typical perching birds, but which has departed from

[1] I have had the opportunity of observing a thrush in the water. A young bird, essaying a flight across the tidal-pool at the mouth of the Awe, lost heart in the middle, and tried to turn back, but bungled the business and fell into the river, luckily for itself not having reached the main stream. Such was its natural buoyancy that its wings at first floated clear of the water, and with them it raised itself in a series of jerks towards the shore. At each stroke, however, its plumage becoming soaked, it sank lower and lower, till its wings, extended to the full, lay along the surface, and it made scarcely any way. So waterlogged was it that it seemed impossible that it should accomplish the last yard between itself and the shore, which at last with infinite difficulty it reached.

[2] *Darwinism*, p. 117.

all its allies in its habits and mode of life, and has secured for itself a place in nature where it has few competitors and few enemies. We may well suppose that, at some remote period, a bird which was perhaps the common and more generalised ancestor of most of our thrushes, warblers, wrens, &c., had spread widely over the great northern continent, and had given rise to numerous varieties adapted to special conditions of life. Among these some took to feeding on the borders of clear streams, picking out such larvæ and molluscs as they could reach in shallow water. When food became scarce they would attempt to pick them out of deeper and deeper water, and while doing this in cold weather many would become frozen and starved. But any which possessed denser and more hairy plumage than usual, which was able to keep out the water, would survive; and thus a race would be formed which would depend more and more on this kind of food. Then, following up the frozen streams into the mountains, they would be able to live there during the winter; and as such places afforded them much protection from enemies and ample shelter for their nests and young, further adaptations would occur, till the wonderful power of diving and flying under water was acquired by a true land-bird."

It may be well to remind ourselves that in the history thus sketched one fragment only is matter of fact, namely, that there are water-ousels. The rest is pure speculation based, not upon that fact, but upon an assumption as to how the fact came to be. "Well," as Uncle Remus has it, "it might have been so; but then, you see, it mightn't." The construction of histories, such as we have heard, proves only this—that by taking a great deal for granted we can imagine things to have proceeded in a certain way. But unless we have good reason to believe that we thoroughly understand the laws and constitutions of organic life, we can have no assurance that the process so imagined is even possible, and still less, if less can be, that it has actually occurred.

It seems very needful to remind ourselves of this, for apparently it is often assumed that, because we can thus in fancy bridge over a difficulty, the difficulty vanishes. But it is hard to see what scientific purpose such imaginative stories serve.

If we wish to know how an ousel dives, the only thing to do is to go and look; it would be worse than useless to consult instead our inner consciousness, as Aelian or Pliny would have done, and then tell the world, as a contribution to its knowledge, how we think it likely that the operation is performed. And yet we know that dive he does, and that there must be some explanation of the operation. In regard of his history, on the other hand, we *know* nothing, except that he exists; we do not know that there is any explanation of his development from a land-bird, because as yet we have not proved that he has so developed; and even if we knew this, we could scarcely pretend, with any show of reason, to describe the complex process of his genealogical descent, when we know that we could not by a like method arrive at the truth concerning the mode of his descent into the water. It is, in fact, only where our ignorance is complete that we venture to amuse ourselves with such conjectures; the greater our knowledge the more we perceive their futility.

There was a time when men fancied that a swarm of bees could be produced by a putrefying heifer, when it was conceivable to them that Daedalus could fly by means of wings fastened with wax to his shoulders, and when they devoted their lives to the quest of the philosopher's stone which should by its touch turn everything to gold. If we find it utterly impossible nowadays to believe these fables, it is simply because we know something more of the real nature of the problems involved. And with all our advance of knowledge the results we have to show are negative rather than positive. We have discovered that much is impossible which had been supposed possible, but we still understand the causes of things so little that we cannot forecast their effects until we have

seen them in operation. We have not, I suppose, got so far as to prove theoretically that birds can fly, though we see them do it every day; we pride ourselves, and justly, on Newton's great discovery, but what gravitation may be we have no conception, nor of its action, except in those circumstances wherein we see it work. The same is true of electricity.

Still more does it hold of the mysterious force we call life. We see it in action, and we witness its propagation; but of its origin, of its nature, of the infinitude of checks and counterchecks which rule its development, we know nothing. We have never seen development going on except under the guidance of man's selection, and, while we have no positive proof that Natural Selection could do even so much as man's, we know that man's can do none of those things which Natural Selection is assumed to have done. We can develope in our domestic animals or plants certain of the qualities which we find in them, but we can never produce a new quality, still less a new species; and the moment we withdraw our hand the race reverts to the original type. How, then, can we say that we know enough about the conditions necessary for the production of fundamental and permanent changes, to make the remotest guess at the manner in which they have been wrought? Has any philosopher ever attempted to explain how it is that the Duke of York's Island encourages whiteness in its birds and insects, and the Philippines metallic colours?[1] that the *Æneas* butterflies have tails towards the Tropics, but never on the Equator? that twenty kinds of American trees differ from their nearest European allies in having their leaves less toothed? that dogs bred in India differ notably from their English parents? that at Mambas cats exchange their fur for stiff hairs? that the caterpillars of Texan moths[2] brought to England and fed on English walnut-leaves developed into moths of apparently a different

[1] Most of these examples are given by Mr. Mivart in his letters to the *Tablet*, May, 1888.

[2] *Saturnia.*

species? that the Australian fishbone-tree should at different stages of its growth exhibit such diverse characteristics as to have been classed in different genera? Again, how shall we explain the fact that the feet of birds, as in pigeons and bantams, often produce feathers exactly on the analogy of wings? No one supposes that they are descended from ancestors with four wings and no legs. How, again, have creatures radically different possessed themselves of some one common feature? Thus an eel and a skate are electrical: a skate and an ant-eater have teeth of a structure quite different from anything found in any creatures intermediate between them; of venomous fangs there are two distinct classes amongst serpents, and a third kind is found in a lizard;[1] the pike, the angler-fish, and some brought from the bottom of the Atlantic by the *Challenger*, have hinge-teeth, the only feature they have in common; orchids and asclepias, plants as dissimilar as possible, have the same machinery for their pollen-grains, described by Mr. Darwin[2] as "a very curious contrivance."

These instances will serve to indicate how supremely little we know of the laws governing life developments; but if we descend towards the root of the matter, to those phenomena which concern the beginnings of life, we find our ignorance still more abysmal. No one has ever been able to guess how it is that from one germ proceeds a frog, and from another, precisely similar, a salmon or an eagle; or from one egg a cock, and from another a hen. How is it that amphibians, as a class, which we are told came before reptiles, differ from these, in some respects, as to the first stages of growth, and agree in the same respects with mammals; and that a few amphibians differ from their own folk and agree with reptiles? How is it, again, that while frogs and newts are generally born as tadpoles, passing to full maturity only in the perfect state, one frog[3] is never a tadpole even in

[1] *Heloderma.* [2] *Origin of Species*, p. 193.
[3] *Rana opisthodon.*

the egg, and some newts[1] breed as tadpoles? All this, and much besides, baffles conjecture, and in face of it how can we pretend to talk of the shapes life would have assumed in circumstances of our imagining? When there is so much before our eyes that we are utterly incompetent to explain, how can we gravely set ourselves to chalk out the course taken by things that we have never seen? In the imaginary history, for example, given of the dipper, we do not even know that any one of the factors ever existed which we employ in our calculation. We do not know that there ever was a "common generalized ancestor" from whom our perching birds are sprung. Even given that ancestor, we do not know by what several lines our existing species have descended from him, for naturalists cannot agree how to classify them. Finally, granting this point again, in evidence for the possibility of all the various stages through which we trace the bird's formation, we have nothing to quote but our own ignorance: we can say no more than this—that we see no difficulty in the way, while there may be ten thousand difficulties which we do not see. It would be cold comfort to the passenger by an express train rushing onward, through a densely dark night, to be told by the driver that he could see no signals at all, and, therefore, was not aware of any portending danger; and in like manner we require from our scientific guides, if they are to inspire our confidence, not merely that they should perceive no obstacles, but that they should descry positive indications that the course is clear.

It will doubtless be said that this is just what evolutionists do, that they deduce from other considerations the truth of the Darwinian theory, and construct hypothetical histories, only to show that there are no insuperable difficulties in the way. But in the first place it may be answered that these histories have no value at all, even for such a

[1] *e.g.* the Axolotl.

purpose, and therefore can serve for nothing but to delude us with a false appearance of knowledge: and in the second place the Darwinian argument, as a matter of fact, does rest largely on proofs of this nature. It is, in fact, only by means of speculations such as this that the process itself of development under Natural Selection is known to us at all. We neither see it in progress, nor have we discovered the various successive forms through which it has operated, nor do we know the original whence it started. We assume that certain forces and agencies, about which we know a little by observation, might have wrought certain changes, if there were nothing to prevent them; but that there is nothing we have no better proof than that we know of nothing. Accordingly, from the very nature of the case, we find this brought as an argument by Darwinians again and again. Mr. Darwin, speaking of the slave-making instinct of ants, after recounting what he conceives to be a possible mode of its origin, concludes by saying:[1] "*I can see no difficulty* in Natural Selection increasing and modifying the instinct." To explain the origin of the hive-bee's architectural skill, he recurs to the example of the Mexican *melipona*, which makes cells circular where free, and flat where they touch other cells. From these, he argues, the hexagonal cells of the bee might have been developed by Natural Selection, and the mode of argument is this:[2] "We must *suppose* the melipona to make her cells truly spherical and of equal sizes: *and this would not be very surprising*, seeing that she already does so to a certain extent, and seeing what perfectly cylindrical burrows in wood many insects can make. We must *suppose* the melipona to arrange her cells in level layers, . . . and we must *further suppose, and this is the greatest difficulty*, that she can somehow judge accurately at what distance to stand from her fellow-labourers. . . . We have further to *suppose, but this is no difficulty*, that after hexagonal

[1] *Origin of Species*, p. 224. [2] *Ibid.* pp. 227, 235.

prisms have been formed . . . she can prolong the hexagon to any length requisite. . . . Thus, *as I believe*, the most wonderful of all instincts can be explained by Natural Selection." By an analogous process, he tells us,[1] "*I believe* that the strange instinct of our cuckoo could be, and has been, generated." So of the eye,[2] "*I can see no very great difficulty in believing* that Natural Selection has converted the simple apparatus of an optic nerve merely coated with pigment and invested by transparent membrane, into an optical instrument so perfect." And again of the lungs,[3] "*There seems to me to be no great difficulty in believing* that Natural Selection has converted a swim-bladder into a lung:" and, as to the independent production of similar organs in different classes of plants or animals,[4] "*I am inclined to believe* that in nearly the same way as two men have sometimes independently hit on the very same invention, so Natural Selection . . . has sometimes modified in very nearly the same manner two parts in two organic beings."

Mr. Darwin was the most scientific and cautious of Darwinians, and his disciples have far outstripped him in the field of speculation. As Mr. Mivart has remarked, Darwinism has this advantage in its favour, that it needs only the suggestion of some seemingly possible advantage as the result, to recommend any of the developments in which it believes. It has accordingly become no small portion of the work of its advocates to set themselves to imagine such advantages. To do so, especially with a little practice, is not difficult: it is a game, and a game very easy to play. On the other hand, when all is done the result remains imagination, and has no right to present itself on the same platform with fact. In the words of the late President of the Linnean Society, to trace the relation between existing floras and faunas and those of other epochs "requires a more lively imagination than I can lay claim to, or

[1] *Origin of Species*, p. 217. [2] *Ibid.* p. 188.
[3] *Ibid.* p. 191. [4] *Ibid.* p. 193.

perhaps than it is desirable to employ in any strictly scientific investigation."[1]

Here, for instance, is another example contributed by Mr. Wallace, an explanation of the fact that rabbits have white tails. This member, he remarks, at first sight appears to be dangerous to the animal as making it conspicuous to its enemies. "But," he goes on, "a little consideration will show that the white upturned tail is of the greatest value, and is really . . . a signal-flag of danger. For the rabbit is usually a crepuscular animal, feeding soon after sunset or on moonlight nights. When disturbed or alarmed it makes for its burrow, and the white upturned tails of those in front serve as guides and signals to those more remote from home, to the young and the feeble; and thus each following the one or two before it, all are able with the least possible delay to regain a place of comparative safety. The apparent danger, therefore, becomes a most important means of security." Obviously it would be a very robust faith that should be wholly satisfied with this demonstration. The hare has a tail even more conspicuous than the rabbit's, yet hares are not gregarious, nor do they run into burrows for safety. The house martin, the bullfinch, and the wheatear, are rendered as conspicuous as any rabbit by the white patches they all bear on their backs, yet no one supposes that in their case these serve as signals. This is an excellent illustration of the facility with which a reason for anything can be found by one who sets himself to seek it. "One story is good until another is told," and the first may be left in possession by the simple process of leaving the other out. Mr. Darwin himself seems to account for the fact that dogs have tails, by saying that these help them to turn,[2] although his candour compels

[1] *Address to Biological Section of British Association*, 1886. By William Carruthers, Pres. L.S., F.R.S., F.G.S., President of the Section.

[2] *Origin of Species*, p. 196.

him to remark that hares double equally well without any such help.

Instances of this sort might be multiplied indefinitely: the following must serve in conclusion. If the caterpillar of the small tortoiseshell butterfly be exposed to light reflected from gilt surfaces, the chrysalis is of brilliant golden lustre. According to the Darwinian theory, this aptitude to become resplendent must point to some advantage accruing to the race, in the past, from its possession. Accordingly it has been assumed that in the original habitat of the species some glittering substance abounded, that it was of advantage to the chrysalis to glitter, that so the insect might be concealed during the most helpless stage of its existence, by assimilation to the rocks from which it was suspended, and that caterpillars sensitive, in this particular fashion, to light, thus survived. The only native substance sufficiently brilliant for this purpose is mica; therefore, it has been said, mica was plentiful in the ancestral region of this butterfly, and by fixing its chrysalis to mica rocks, whose sparkle they had learnt to simulate, did the more favoured of its members succeed in life. But the regions where micaceous rocks occur are few and narrow, while the range of the butterfly is very wide, and therefore, as Mr. Wallace cautiously concludes,[1] "this seems a rather improbable explanation." Accordingly, as he goes on to admit, the occurrence of this metallic appearance still remains a difficulty.

There yet remains another point of view from which the method of scientific research hitherto discussed must be considered. The fashion of adopting theories as established dogmas, and making it our task not so much to test them as to devise a mode of reconciling to them whatever facts we discover, appears to threaten a real danger to science itself. It seems at the present day to be considered a necessary part of a scientific outfit that one should have some sort of a theory by which to explain every

[1] *Darwinism*, p. 198.

department of the world of life. That an inquirer should have no speculation in his eyes seems to be thought as uncanny as is the case of Banquo's Ghost. Yet it may easily be that the glitter of such hypotheses blinds the eye for sober facts, and that the adoption of a theory makes a man, quite unconsciously, a mere special-pleader. As has been already said, it is no hard task to devise a plausible-looking explanation which shall harmonize fact with theory; and it is to this task that writers of the modern school appear too often, before all else, to devote themselves. Yet the scientific investigator, as such, is the very humble servant of facts: his business is to question them, not to suggest their answers; and in so far as he forgets this, he is false to science.

It is not difficult to find evidence that even Mr. Darwin himself did not escape this peril. Honest and conscientious as he was, once he had adopted his own hypothesis he seems to have seen everything through its medium, and, quite unwittingly, his first impulse in face of a new phenomenon, was to ask, not what it might really portend, but how it might be made to tally with the theory he loved: in fact, as he once playfully confessed,[1] "There is nothing like one's own hobby-horse." It seems impossible to avoid the conclusion that his mind was thus unduly biassed, when we find that phenomena which seemed to militate against his theory were distasteful to him. Thus he, clearly, could never really persuade himself that the complex mechanism of the eye, and other organs, could have been devised by Natural Selection, and on this subject he writes: "I remember well the time when the thought of the eye made me cold all over, but I have got over this stage of the complaint, and now small trifling particulars of structure *often make me very uncomfortable.*"[2] The artistic beauty of certain structures affected him in the same way. So, again, the theory that butterflies have been made beautiful by the operation of sexual selection receives a shock from the fact that

[1] *Life and Letters*, ii. p. 257. [2] *Ibid.* ii. p. 296.

caterpillars, which do not breed, are sometimes beautifully and artistically coloured, and, moreover, so coloured as to make them conspicuous instead of protecting them. "What would you answer?" Mr. Darwin asks Mr. Wallace. "I could not answer, but should maintain my ground." Again, of the same Mr. Wallace's article in the *Quarterly*, agreeing in the main with his own views, but differing with regard to man, and arguing powerfully for his separate place in nature, Mr. Darwin speaks regretfully:[1] "Wallace's article struck me as admirable, . . . but I was dreadfully disappointed about man; it seems to me incredibly strange." Of a fact with regard to the colour of insects which supports his theory, he says:[2] "The case of the *Solenostoma* is magnificent;" of another fact about the colours of birds, which seems to contradict it: "I find it is most difficult, but not I think impossible, to *imagine* how, for instance, a few red feathers appearing on the head of a male bird, and which are at first transmitted to both sexes, could come to be transmitted to males alone:"[3] and of the dull colours of certain female birds with brilliant mates,[4] "I *earnestly wish to see reason to believe* that each is specially adapted for concealment to its environment."

Other samples of the same sort might be quoted, but these appear sufficient to show that the first question suggested by a new discovery was not so much what it naturally appeared to signify, but how it might be reconciled with the theory of Natural Selection. Mr. Darwin, however, always remained the most painstaking and accurate of observers, his theory notwithstanding; in the case of others of his school the faculty of observation itself seems to be affected by this sort of enthusiasm for a preconceived hypothesis. An excellent example may be cited from Mr. Wallace. Insects, as we know, are valuable auxiliaries to flowers, carrying the pollen from one to another of the same species, and thus

[1] *Life and Letters*, iii. p. 117. [2] *Ibid.* ii. p. 122.
[3] *Ibid.* ii. p. 123. [4] *Ibid.* p. 124.

securing cross-fertilization. According to the Darwinian explanation, the colours of flowers have been developed through this agency, those which best help the insects to find honey having been preserved. Enlarging on this theme, Mr. Wallace writes:[1] "Economy of time is very important both to the insects and the flowers, because the fine working days are comparatively few, and if no time is wasted the bees will get more honey, and in doing so will fertilize more flowers. Now, it has been ascertained by several observers that many insects, bees especially, keep to one kind of flower at a time, visiting hundreds of blossoms in succession, and passing over other species that may be mixed with them.[2] It is probably to assist the insects in keeping to one flower at a time, which is of vital importance to the perpetuation of a species, that the flowers which bloom intermingled at the same season are usually very distinct both in form and colour. In the sandy districts of Surrey, in the early spring, the copses are gay with three flowers—the primrose, the wood-anemone, and the lesser celandine, forming a beautiful contrast, while at the same time the purple and white dead-nettles abound on hedge banks. A little later, in the same copses, we have the blue wild hyacinth (*Scilla nutans*), the red campion (*Lychnis dioica*), the pure white great starwort (*Stellaria Holostea*), and the yellow dead-nettle (*Lamium Galeobdolon*), all distinct and well-contrasted flowers. In damp meadows in summer we have the ragged-robin (*Lychnis Flosculi*), the spotted orchis (*O. maculata*), and the yellow rattle (*Rhinanthus Crista-galli*): while in drier meadows we have cowslips, ox-eye daisies, and buttercups, all very distinct both in form and colour." A description of this kind seems intended to afford a complete picture, and the reader who is not a botanist will probably conclude that a full catalogue has been given of the flowers likely, at

[1] *Darwinism*, p. 318.

[2] It may be remarked in passing that observation does not bear out this assertion.

any season, to be intermixed. What may be the case in Surrey I cannot say of my own knowledge, but certainly things do not arrange themselves thus simply in the North. Of spring flowers, not mentioned by Mr. Wallace, there are the violets, whereof we have three species,[1] including probably several varieties; and it should be remarked that a species is in most danger from a mistake between it and a kindred species. Besides this, flowering at the same time with the scentless violets, there is the ground-ivy,[2] so like in colour as often to deceive the eye, and the bugle[3] is so like this again as to puzzle young botanists. The red campion and ragged-robin bloom with us simultaneously, and their hue, though not their form, is much the same, while the wild geraniums, which often accompany them, are in this respect very similar. The greater stitchwort is not ill-matched by the starwort[4] and the wood-sorrel,[5] while several of the cresses resemble it in colour. But, not to multiply examples, it is in the description of the summer flora, that of the honey-season, when guidance should most be needed, that omissions are found. In meadows, Mr. Wallace tells us, we then find "cowslips, ox-eye daisies, and buttercups, all very distinct both in form and colour." With us the cowslips go long before the ox-eyes appear, and almost before the buttercups, but let that pass. Of buttercups there are three kinds, equally common, and to non-botanical eyes quite indistinguishable,[6] and of their own family we probably find the spear-wort and marsh marigold,[7] like them in shape and colour, in their near neighbourhood. Besides these, we find the silver-weed,[8] the cinquefoil,[9] the tormentil,[10] and the bird's-foot trefoil,[11] all like the buttercup in hue, and all except the last in form; to say nothing of all the tribe of the composites, dan-

[1] *Viola odorata*, *canina*, and *palustris*. [2] *Nepeta Glechoma*.
[3] *Ajuga reptans*. [4] *Stellaria nemorum*. [5] *Oxalis Acetosella*.
[6] *R. acris*, *repens*, and *bulbosus*. [7] *R. Flammula* and *Caltha palustris*.
[8] *Potentilla Anserina*. [9] *P. reptans*. [10] *P. Tormentilla*.
[11] *Lotus corniculatus*.

delions, hawkbits, sow-thistles, and hawkweeds, all of them also yellow. This is not an imaginary picture: all of these I myself found, inextricably intermingled, in the first field I visited after reading the description quoted from Mr. Wallace. There are in fact many flowers, always neighbours, which seem positively to counterfeit one another. What can be more alike than the true and the barren strawberry?[1] than the cross-leaved and five-leaved heaths?[2] than the scabious, the devil's-bit, and the knautia?[3] than the various forget-me-nots, and speed-wells, and thistles, and, still more than these, the large classes which are compendiously classed by the public as "dandelions" and "hemlocks,"[4] respectively, whereof the former jostle one another in our fields, and the latter in our woods, most of all perhaps the various willows? For an insect which can steer his way among the various species of these puzzling tribes any guidance of colour or form can scarcely be necessary.

It would thus appear that theory may be so exalted as to usurp the province of facts, shaping them to its requirements, rather than taking its shape from them. This must be the inevitable result of the premature adoption of hypotheses—before we are in possession of a mass of facts, the plain teaching of which is all one way, irresistibly suggesting one conclusion. A theory about which we have to be perpetually on the strain, ever explaining away difficulties, and dredging for fresh arguments, is by that very fact condemned. We cannot imagine Newton, after the discovery of gravitation, to have been in the fever of excitement as to the verdict of others, in which Mr. Darwin's correspondence proves him to have been, even to the end. A doctrine which speaks for itself stands in no need of other approval: the loss is theirs who fail to embrace it.

[1] *Fragaria vesca* and *Potentilla Fragariastrum*.
[2] *Erica Tetralix* and *cinerea*.
[3] *Scabiosa arvensis, S. Succisa, Knautia arvensis*.
[4] *Compositæ* and *Umbelliferæ*.

In a word, therefore, we know far too little to frame histories of any value in the domain of organic life; and by attempting to do so we delude ourselves into the flattering belief that we have discovered the causes of things, while the only sound theory for us is that of these causes we know nothing. We may easily, moreover, become the propagandists of a theory for its own sake rather than that of science, and in its interests may discard the open mind and colourless eye that should mark the philosopher. As a consequence, the result of our work may be rather a plea for theory than a genuine contribution to knowledge. To extend to the whole domain of biology what Dr. Robert Brown says of one of its departments, that of migration:[5] "There is much speculation and many specious theories intended to dove-tail into some broader hypothesis, but sound inferences from well confirmed facts are much rarer than one might have hoped after the years of observation which have been lavished upon it."

Postscript.

Since the article here reproduced was written, I have had an opportunity of watching the behaviour of a young dipper in the water, on a singularly trying occasion. A nest built on a branch over one of the most boisterous portions of our river contained a brood as yet unfledged, the quill feathers of the wings just appearing. One of the young birds having been taken out for examination, another, disturbed apparently by the proceeding, clambered through the opening and fell headlong into the water. He was on the edge of a strong current, with no smooth water within reach unless he could climb over a slippery stone which bounded the rapid. This he could not manage, but swimming and diving, he nevertheless contrived, for about a minute, to avoid being swept away, the place being too difficult for a rescue. Finally, the current caught

[5] *Short Studies from Nature*, p. 66.

and whirled him away, taking him over a small fall, below which he was carried under water, and appeared hopelessly lost. Nevertheless, he presently came to the surface, as full of resource as ever, and a few yards down, where the current began to tail away, he swam quickly to the shore, where, being immediately picked up and dried, he was restored to the nest apparently in good health and spirits.

The nature of the water made it difficult to observe his motions when beneath its surface, but my impression was, that he certainly used his wings as well as his feet for propulsion.

I have this spring (1891) heard the song of the dipper in very peculiar circumstances, namely, when flying at full speed. The bird was pursuing his mate down the river, and while so engaged poured out an unbroken strain. I heard it coming towards me, growing louder and louder with singular rapidity, but could not imagine whence it came till the singer rushed past, something in the manner of a whistling express.

The Empire of Man.

In order to discover whether there are men in the moon, it was once ingeniously proposed to take some large plain on the earth's surface, so large as to be visible to observers in our satellite, as the Sahara, and thereon to construct on a colossal scale the figure by which Euclid solves his forty-seventh proposition. If there are beings like ourselves in the moon, it was argued, they must by this time have worked out the same theorem for themselves; they will recognize the figure as a signal hung out by an intelligence, and will respond in similar fashion, and thus will a beginning be made towards a code of intercommunication.

Whatever may be thought, from a practical point of view, of this suggestion, it serves, at least, to emphasize the fact, that there are certain steps on the road to intellectual development, which it may be assumed that man would make, simply as man, certain advances which we might reckon on his race accomplishing, quite apart from any circumstances in which it might be placed. But when our attention is directed to this point it must very soon appear that what we could thus anticipate of the condition of the race, taking into account its own inborn resources alone, is extremely little. To construct for ourselves any real idea of the point of progress reached by a race like ours, it would be absolutely necessary to know what instruments were afforded

by the world in which they were placed to enable them to work it out. For the discovery of pure mathematical truth man has sufficient materials in himself: it is not so with scientific truth, still less with arts and industries. As Sir John Herschel has remarked, it is conceivable that a man shut up in a solitary dungeon should think out for himself all that we know of mathematics, but he could never tell without trying what would happen to a lump of sugar when put into a cup of tea. In like manner it would not avail, for the purpose above described, to flash an electric signal to the moon, unless we were certain that, if there be inhabitants there, they must necessarily have the materials needed for the production of the electric light; and even the geometrical symbol whereof we have spoken would have to remain unanswered, though such inhabitants recognized its import, if the stuff of which their world was composed could be worked into no tools bigger than toothpicks.

The development of the human race, in fact, of which we are so proud, its conquest and subjugation of the earth, its manufactures, its arts, its engineering triumphs, its commerce, its inventions, its scientific discoveries, even what seems to be most purely its own, the *litteræ humaniores*, its accumulated literatures —all is found to be inexorably conditioned by the material circumstances of the earth on which our lot is cast. What would the case have been had there been nothing that could serve the function of paper and ink? What if no tree had borne anything like cotton, and no animal produced any fleece like wool, or any web like silk? What would have become of navigation had there been no timber but grass-stalks, or if hemp had been unknown? Where would the chemist, or the astronomer, or the microscopist have been without glass? or the sculptor without marble, that paper specially prepared, as Mr. Ruskin tells us,[1] and hot-pressed for his particular requirements?

[1] *Stones of Venice*, III. i. 41, 42.

It must be remembered that we might very conceivably have been without many or all of these things. We are so accustomed to have them that we are too apt to take them for granted, and thus to miss the full significance of their presence. The plants for example which afford us clothing stuffs, as cotton and flax, are a very small minority in the vegetable kingdom. That minority might very easily have been stamped out in the struggle for existence. Everything which bears a flower bears also what is botanically known as a "fruit." Yet how small a proportion of these can serve the purpose of food. Is there anything in the nature of things to make it necessary that this purpose should have been served by any?

Nor only this. How much of man's development would have been possible had there not been in the organic world around a capability of development under his hand: if the wild originals of our wheat and oats had not been ready to swell their ears in his fields, as they will never do elsewhere; if the crab had not contained the potentiality of the apple, a potentiality to be realized only in his orchards: if the sheep had not been prepared to yield him a richer fleece than she would ever have provided for her own needs, the silkworm to spin a fuller and finer cocoon, the cow to provide a supply of milk at once more ample and richer, the horse and the dog to endow the hunter and the shepherd with powers new not only to him, but to themselves, till they fell under his guidance and control?

Nature was from the beginning fitted to his hand, and no less was his hand fitted to rule Nature. It has been pointed out by Mr. Wallace[1] that there is much in the physical structure of the lowest savage which cannot be accounted for by any experience of the race prior to that point of development at which such savages stand, and which consequently is not explained by any merely materialistic theory of evolution. We are assured by those who propound

[1] *Natural Selection*, pp. 349, seq.

such theories that only those qualities arise or survive which are of service to the individuals possessing them. They are therefore a record of the past, and of the past alone; to be accounted for only by what has been, not by that which is to be. But there are infinite possibilities in the hand, for instance, of a savage, which are of no actual use to him, because he has nothing on which to exercise them, and cannot have been of service to any of his progenitors, if they have been still lower in the scale than himself. His nicest instruments are perhaps a club or a stone scraper, yet is his hand quite capable of being taught to manipulate a penknife or a needle. His voice too is capable of being trained to sing, though he has no notion of any nearer approach to the divine art of music than a more or less monotonous howling. "It seems," says Mr. Wallace, "as if the organ had been prepared in anticipation of the future progress of man, since it contains latent capabilities which are useless to him in his earlier condition."

Still more, according to the same author, is this true of the most important of all organs—the brain. The size of this, as science emphatically declares, is closely connected with the intelligence of its possessor. It would therefore appear that only where intelligence has been actually developed to its highest pitch we should find a corresponding development of brain capacity, and in the lower and undeveloped races of men we should find that size of the organ, and no more, which would correspond to the advance they have accomplished beyond the brutes in intellectual power. Yet this is far from being the case. The brain of the savage, Mr. Wallace again tells us,[1] is far larger than he needs it to be, or than his history will account for its being; and what is probably the very oldest known skull, that of a man contemporary with the mammoth and the cave bear, "might," according to Professor Huxley, "have belonged to a philosopher." Thus it seems to be not the past but the future history of man's race

[1] *Natural Selection*, p. 337.

which explains his outfit; he is seen to have had a power, at the very outset of his career, which he could not have acquired for himself; and this power of his, making him fit to mould Nature to his requirements, is the exact complement of Nature's passive capacity to be moulded, whereof we have seen something above.

From such considerations it must appear that the history of human progress, the last and the noblest page in the history of the development of the earth, is very far more complex and intricate than philosophers of the evolutionary school would lead us to suppose. To judge from their utterances, it would seem that we have but one factor to deal with, the developing creature himself. The nearest approach to a fundamental philosophy with which they favour us is an assurance that, given the play of organism and environment through a sufficient number of ages, such a state of things as that in which we live was bound to come about, through the constant survival of those most worthy to survive; and we are invited from a view of what has actually resulted to accept the conclusion that this and no other must have been the result, and that therefore the creed of Evolution is justified by its works.

Obviously, however, it is no such thing, and there are many elements which have most powerfully affected the actual issue, whereof the evolutionist theory affords no explanation at all. Granting that Natural Selection, or any other materialistic machinery, could do all that is claimed for it, that it can suffice to explain the presence of all organs and all instincts or other mental powers, how does it account for the fact that there were metals in the earth, or that water was convertible into steam, that there were such things as fuel and potter's clay, such vegetables as grapes and potatoes, such animals as dogs? All of these have been instruments, all of them powerful, some absolutely essential, for making human civilization what it is, but assuredly it is not the power of Natural Selection as it may

have worked in man that explains their existence.

The final outcome of development, therefore, as witnessed in the actual progress of the human race, is very far from affording an argument in favour of the evolutionary doctrine as popularly proclaimed; on the contrary, it presents the gravest possible objections against it. Evolutionists have been labouring these many years to convince the world that man might have come to be as he is, in bodily structure and mental power, by the operation of blind material laws, without calling in the aid of design to account for results. But even supposing their success in this endeavour to be on a par with their professions, they are but landed at the end in face of a swarm of fresh difficulties, and have to confront their old antagonist, the doctrine of design, as vigorous and as formidable as ever. For, undoubtedly, to suppose the world in its entirety to be the product of a designing mind, would be an explanation of the existence of all the machinery it contains, however complex; while it is equally apparent that Natural Selection can no more account for it, than the science of geometry can explain the attraction of gravitation.

So evident is this, that as a matter of fact evolutionist philosophy either leaves this point altogether out of sight, or, if it deigns to notice it, does so in terms which, when looked into, are found to be absolutely devoid of meaning, as may be seen from the following example.

Nothing assuredly has more powerfully contributed to establish man's dominion over the earth and all it contains, than the supply of coal and iron which he has used for every kind of purpose. When men had nothing but flint stones to make their weapons and their tools, it was quite impossible for them to reach any notable height of material civilization. Even when they had possessed themselves of bronze and brass there was much still quite beyond their reach, without which at the present day we should hardly consider life worth living. We need iron

equally for purposes of agriculture, of manufacture, and of locomotion; all that constitutes the special glory of the nineteenth century depends absolutely on our possession of this metal: and to have iron to use, or to be able to use it when we have it, we require coal. Assuming therefore that England at the present day presents a fair sample of the highest stage of development yet reached by man, we have to acknowledge that if we have attained it, the fact is to be attributed quite as truly to our coal-fields as to ourselves, and we wish to know how it came to pass that, in the first place, our race possessed potentialities which could be realized only by the existence of something quite distinct from ourselves and beyond our control, and in the next place how it came about that what we thus required lay ready and awaiting us.

On these points Professor Huxley apparently intends to enlighten us in his well-known lecture on the Formation of Coal.[1] In listening to him we have the satisfaction of knowing not only that he is probably the ablest advocate of the evolutionary creed, but that in particular he pleads guilty to an ineradicable fondness for clear speaking, and is most severe on the speech which darkeneth counsel, as he finds it exhibited in the writings of Suarez. Moreover, he was accepted by Mr. Darwin himself as the clearest expositor of his theory, as one who made the matter so plain that to none but a blockhead could it fail to be as clear as daylight.[2] Therefore, if there is an explanation forthcoming from the evolutionary standpoint, it is from this writer that we may expect to learn it. To what does Professor Huxley's explanation amount?

In the first place, he fully concedes to coal the important place in the history of development that we have claimed for it. Speaking of the growth of our manufactures and industries, he tells us:[3] "Coal

[1] *Critiques and Addresses*, pp. 92—110.
[2] *Darwin's Life and Letters*, iii. p. 30.
[3] *Critiques and Addresses*, p. 109.

is as much an essential condition of this growth and development as carbonic acid is for that of a club-moss. Wanting coal, we could not have smelted the iron needed to make our engines, nor worked our engines when we had got them. But take away the engines, and the great towns of Yorkshire and Lancashire vanish like a dream. Manufactures give place to agriculture and pasture, and not ten men can live where now ten thousand are amply supported."

So far then we are clear. Coal is an essential factor in our development. But how came that factor to be supplied? There would seem to be but two possible replies, either its occurrence was due to chance, or it was due to design. But according to Professor Huxley it was due to neither. Chance, we know, he utterly repudiates as an absurd and impossible agent. As to design, it will appear to most minds, as to Professor Stokes, that it is altogether unmeaning without a designing mind, which is just the last thing which philosophers of Professor Huxley's school are willing to recognize.

What then was it that provided coal for man, if it was neither chance nor purpose? Professor Huxley tells us that it was "Nature." Early in the earth's history, he tells us,[1] "Nature" invested an enormous capital in the formation of coal-beds. Six millions of years, as he calculates, must at the least have been needed to provide them as they are, and so lavish was the process that a being capable of thinking, who had witnessed its progress, would have moralized on the wanton extravagance which she displayed in her operations.[2] But "Nature" knew better; she seems to have had always before her eyes the adage, "Keep a thing long enough, and you will find a use for it." She kept her coal stores accordingly till the eighteenth century arrived, and with it James Watt. The brain of that man was the spore out of which was developed the steam-engine, and all the prodigious trees and branches

[1] *Critiques and Addresses*, p. 106. [2] p. 108.

of modern industry which have grown out of this. "Thus," concludes the Professor, "all this abundant wealth of money and of vivid life is Nature's interest upon her investment in club-mosses and the like, so long ago. But what becomes of the coal which is burnt in yielding this interest? Heat comes out of it, light comes out of it, and if we could gather together all that goes up the chimney, and all that remains in the grate of thoroughly-burnt coal fire, we should find ourselves in possession of a quantity of carbonic acid, water, ammonia, and mineral matter, exactly equal in weight to the coal. But these are the very matters with which Nature supplied the club-mosses which made the coal. She is paid back principal and interest at the same time; and she straightway invests the carbonic acid, the water, and the ammonia in new forms of life, feeding with them the plants that now live. Thrifty Nature! Surely no prodigal, but most notable of housekeepers!"

In the name of bewilderment, what is the meaning of this? *Quid est hoc? Quantum sapio, quantum capio, quid est hoc?* Who or what is it that does all these fine things—investing capital, and saving principal and interest, and proving the thriftiest of caterers? Nature? Who is she? or what is it? Is it meant that the coal was stored up on purpose to be burnt? Surely not, for to say this would be a piece of "coarser and commoner teleology," like saying that the eye was made for the purpose of seeing—a doctrine against which Professor Huxley pronounces anathema.[1] Is it meant, on the other hand, that coal happened to be formed by one set of circumstances, and happened to prove useful through another set, wholly and entirely different? But if so, where is the housekeeper? And why pay any compliments to the thrift exhibited in the transaction? We do not call a piece of amber thrifty because it entraps a fly, and then succeeds in securing interest as a curiosity in a museum, while keeping the principal hermetically sealed up. Are

[1] *Darwin's Life*, ii. p. 201.

words supposed to convey a meaning? and if so, what is the meaning of "Nature"? As Mr. Wollaston well puts it,[1] "Who is this Nature, we have a right to ask, who has such tremendous power, and to whose efficiency such marvellous performances are ascribed? What are her images and attributes when dragged from her wordy lurking-place? Is she aught but a pestilent abstraction, like dust cast in our eyes to obscure the workings of an intelligent First Cause?"

That is in fact what it comes to. "Nature" is a word to juggle with. The need of purpose to explain the world is so stringent that even those who would deny it are fain to have recourse to it; essaying at once to run with the hare and hunt with the hounds, they talk in a way that means nothing at all unless it means that purpose has operated, and to escape from the necessity of admitting a mind whose the purpose is, they tell us that it was "Nature's," and that Nature is unconscious. "Some people," says Dr. Asa Gray, "conceive of unconscious purpose: it seems as easy to conceive of white blackness." If, according to Professor Huxley's own definition, Nature is "that which is," we mean no more by saying that its capital was invested in club-mosses and realized through steam-engines, than that there have been club-mosses and have likewise been engines, and Topsy's philosophy is the true one—"'Specks I growed."

This point is not an accidental and insignificant one, which may be neglected with impunity, it is really the foundation-stone on which any philosophy of the world must rest, and on which, as far as professions go, evolutionary philosophy is content to base its claims. Professor Huxley, amongst others, is very positive on the point, declaring[2] that "perhaps the most remarkable service to the philosophy of biology rendered by Dr. Darwin is the reconciliation of teleology and morphology, and

[1] *Annals and Magazine of Natural History*, Third Series, vol. v. p. 132. See *Darwin's Life*, ii. p. 284.

[2] *Darwin's Life*, ii. p. 201.

the explanation of the facts of both, which his views offer." But his championship of the doctrine, under this aspect, is precisely of the nature most calculated to ruin it. His native gift of a clearness which few can rival, when he is speaking of an object that can be clearly spoken about, is apt to let in inconvenient light on those whose only possible habitation is fog and mist. The most accurate of draughtsmen must needs fail if he essays to delineate a square triangle, or the landscape of a world of two dimensions only, and we find it quite as impossible to form an idea of the system which Professor Huxley would portray and present for our acceptance, as being that which rules the destinies of the universe.

In the first place, it is an unfortunate, but perhaps inevitable, circumstance that he should always speak of "teleology," instead of using a plain English word to express his precise meaning. "Teleology" means, from its derivation, "the science dealing with ends." But what sort of ends? the ends to which things come? or those to which they are directed? There is all the difference in the world between the two. It hardly needs a philosopher to tell us that coals come to be burnt: but it is otherwise with their being made for that purpose. The rock of St. Helena was, in a very true sense, the end of Napoleon's ambition, but to understand his life we have to consider a very different end of his schemes than this. As far as we can make out from his words, however, it is in the former sense alone that Professor Huxley speaks of "teleology." Acknowledging and glorying in the fact, that Mr. Darwin's theory deals a death-blow to the idea that the eye was made on purpose to see,[1] he goes on to assure us that "there is a wider teleology which is not touched by the doctrine of Evolution, but is actually based upon the fundamental proposition of Evolution. This proposition is that the whole world, living and not living, is the result of mutual interaction, according to definite laws, of the powers

[1] *Darwin's Life*, ii.

possessed by the molecules of which the primitive nebulosity of the universe was composed. . . . The teleological and the mechanical views of nature are not, necessarily, mutually exclusive. On the contrary, the more purely a mechanist the speculator is, the more firmly does he assume a primordial molecular arrangement of which all the phenomena of the universe are the consequences."

In order to understand to what this explanation comes, we must ask what we are to understand by "laws," for these it is, apparently, that govern the process here adumbrated. Professor Huxley himself answers the question. He tells us[1] that a law is nothing more than a convenient way of stating that from past experiences we are justified in expecting a certain phenomena in certain circumstances, as that a stone if left unsupported will fall. Moreover, he explicitly denies that "law" in his sense implies necessity. "It is very convenient," he says, "to indicate that all the conditions of belief have been fulfilled, by calling the statement that unsupported stones will fall to the ground a 'law of Nature,' but when we change *will* into *must*, we introduce an idea which does not lie in the observed facts, and has no warranty that I can discover elsewhere. For my part, I utterly repudiate and anathematize the intruder. Fact I know, and Law I know; but what is this Necessity save an empty shadow of my own mind's throwing?" Again, in another work he declares[2] that "calling our often verified experience a 'law of nature' adds nothing to its value, nor in the slightest degree increases any probability that it will be verified again, which may arise out of the fact of its frequent occurrence."

But if this is so, what is the possible meaning of saying that the present order of the universe has been worked out "according to definite laws," and that the recognition of this fact is the truer and nobler "teleology"? If "law" is only a more con-

[1] "On the Physical Basis of Life." (*Lay Sermons*, p. 143.)
[2] "Hume," *English Men of Letters*, p. 131.

venient term for "verified experience," how does it differ from "fact"? And what more do we signify by saying that things have been worked out according to a certain law, than that they have, as a matter of fact, proceeded in a certain way? It would appear, therefore, as already said, that we are to mean no more when we speak of "teleology," than that things have resulted as they have resulted, through various stages, which have been just what they were. The proposition is sufficiently obvious, but what other claim to consideration it may possess is hard to discover.

There is another point in Professor Huxley's explanation which must not be overlooked, if we wish fully to appreciate the scientific value of his system. Though, as we have seen, he repudiates and anathematizes the introduction of Necessity, and has reduced Laws to a convenient term for verified facts, he yet assures us that the said Laws enable us to forecast the future. We know, for example, that unsupported stones will fall to the ground. What is the process by which we arrive at this knowledge? "Simply, that, in all human experience, stones have fallen to the ground under these conditions; that we have not the slightest reason for believing that any stone so circumstanced will not fall to the ground; and that we have, on the contrary, every reason to believe that it will so fall."[1]

This looks very much like saying that we know they will fall, because we know it. But if anything in the shape of a reason is offered at all, it is that stones have always been known to fall. But surely that is no reason, though the phenomenon may help us to discover one. The appearance of the *Times* newspaper from Monday to Friday is not the reason of its appearance on Saturday, though I may gather from the regularity of its issue that there is a staff at work capable of making it appear again. The constant repetition of the same phenomenon tells me

[1] *Lay Sermons*, p. 143.

no more than that it is not an accident, but due to some ulterior cause producing regularity. "It may be urged," says Cardinal Newman,[1] "if a thing happens once it must happen always; for what is to hinder it? Nay, on the contrary, why, because one particle of matter has a certain property, should all particles have the same? Why, because particles have instanced the property a thousand times, should the thousand and first instance it also? It is *primâ facie* unaccountable that an accident should happen twice, not to speak of it happening always. If we expect a thing to happen twice, it is because we think it is not an accident, but has a cause. What has brought about a thing once, may bring it about twice. *What* is to hinder its happening? rather, what is to make it happen? Here we are thrown back from the question of Order to that of Causation. A law is not a cause, but a fact; but when we come to the question of cause, then we have no experience of any cause but Will."

There, in effect, is the knot of the whole question. Is it possible for our minds even to conceive an intelligible solution of the problem, other than the operation of a Will? The *Times* appears, because man's will has determined its appearance; we can trace the chain of effects involved, satisfactorily to that as the initial cause. A stone falls, because the earth attracts it; the earth attracts it because—what? Because it *does*, is the only answer vouchsafed by the new philosophy.

It is constantly assumed by our scientific expositors that because we have tracked back the sequence of events occurring in Nature, far beyond the point at which the ancients had to abandon it, we have therefore entered into the felicity proper to those who understand the causes of things. But till we find some solid ground on which to start, what else are we doing but resting the earth on the elephant, and the elephant on the tortoise? To say that the thousandth link of a chain must hang securely

[1] *Grammar of Assent*, p. 69.

because the hundredth does so, is not to tell us what supports the first. Yet it is a precisely similar conclusion with which our modern teachers would have us rest satisfied. It seems to Professor Huxley, for instance, a sufficient explanation of the origin of our present order to tell us that "the existing world lay potentially in the cosmic vapour, and that a sufficient intelligence could, from a knowledge of the properties of the molecules of that vapour, have predicted the exact constitution of the animal kingdom in Britain to-day, with as much certainty as one can say what will happen to the vapour of the breath on a cold winter's day."

Brave words these indeed: but what, after all, do they come to? Simply to this, that one who could see what the world was going to be, could predict its future. It does not follow because I know when a clock will strike twelve, that I can tell who made it: and all that the foregoing explanation means is that the universe is a clock which at a certain remote time was going. Once more we are given as philosophy, what is but a bald statement of fact.

To come back to our original example. Which philosophy seems to afford the more rational explanation of the multitudinous circumstances which have served to make the race of man what it is? Is it that which talks of Nature and Law as the ultimate agents? or that which tells us that God making man, blessed him and said to him, Fill the earth and subdue it, and rule over the fishes of the sea, and the fowls of the air, and all living creatures that move upon the earth?

The New Genesis.

Those who wish to understand the new Gospel of Evolution in its entirety, to see what the theory is, to which, we are assured, science gives its sanction, have hitherto laboured under many difficulties. Not every one has the time to peruse the works of Mr. Darwin and Mr. Herbert Spencer, or Professors Huxley and Haeckel; and few of those who have the time, have the power to master their teaching in all its bearings, or to construct therefrom a system of philosophy. At the same time, the new ideas, of which these are the authorized exponents, are so much in the air, their praises are so loudly sung and their superiority to old and effete notions so vociferously proclaimed, that curiosity must needs be awakened, and it must be felt as a hardship to be shut out from the intellectual wealth of the new Eldorado, into which these bold explorers have pushed their way. It must, therefore, be a source of much satisfaction to have this wealth brought to our own doors, to have the evolutionary theory "in relation to the totality of things," set forth "in clear and, as far as possible, simple words." This boon Mr. Edward Clodd has conferred on the world in his *Story of Creation: a plain account of Evolution*,[1] and in studying it we have the satisfaction of knowing that we are listening to an accepted authority of the

[1] *The Story of Creation*: a plain account of Evolution. By Edward Clodd, Author of *The Childhood of the World*, &c. Fifth and sixth thousand. Longmans, Green, and Co., 1888.

evolutionary propaganda. Mr. Clodd has written other books, dealing with separate branches of the evolutionist creed, works which are translated into many languages and issued in cheap editions for the benefit of school-children, and in embossed type for the blind; works which have been bought by many thousands. We need, therefore, be under no fear lest we be defrauded of enlightenment, by having the great doctrine inadequately set before us.

What, then, is the outcome of this "plain account"? Obviously the work which undertakes to present it, courts examination, and, as obviously, the subject calls for plain speaking. Either the evolutionary doctrine is the greatest boon ever presented by human sages to their fellow-men, or it is an utter nuisance. It claims to sweep away all existing creeds, and all the foundations on which morality has hitherto been supposed to rest; to prove them false and misleading; and to substitute for them another belief, and another basis of right and wrong, truer and more substantial. If its claim be established, it certainly deserves our unbounded gratitude, both for what it takes away, and for what it gives; but if the story it asks us to accept be an absurdity, and the foundation on which it bids us build be but a bag of wind, it becomes a manifest duty to lay bare the fraud in uncompromising terms.

Let us, therefore, study honestly, and from the stand-point of pure reason, the story of evolution as told by Mr. Clodd. In the first place, this is what the story comes to, and it shall be given, as far as possible, in his own words.

"The Universe," by which word is designated 'all that exists,' "is made up of Matter and Power,"[1] the power being material and inherent in the matter.[2] "The problem we have to consider is this: Given Matter and Power as the raw material of the universe, is the interaction of Power upon Matter sufficient to account for the totality of non-living and living contents of the universe."[3] This question we are to

[1] p. 6. [2] p. 137. [3] p. 136.

answer in the affirmative. "All changes of state are due to the rearrangement of atoms through the play of attracting forces and repelling energies;"[1] "the nebulous stuff, of which the universe is the product, held latent within its diffused vapours, not only the elements of which the dry land and the waters are built," but also all life, and man into the bargain, with all his works.[2] Life is but an arrangement of matter, so as to live; mind is but an arrangement, so as to think; "the chemic lump arrives at the plant and grows; arrives at the quadruped and walks; arrives at the man and thinks."[3] The process has been this. First from diffused matter were evolved stellar systems; and "given the play of force and energy upon the diffused matter, the mechanics of the process, which resulted in the visible universe, are not difficult of explanation."[4] Worlds being thus provided, the next step was to develope life. "The simplest compounds of elements were formed first, the combinations becoming more and more complex, until they reached that subtile form which is the physical basis of life, and which, starting in water as a structureless jelly, has reached its fullest development in man."[5] For finally, "mind, as a special form of life, takes its place as the highest product of power upon matter."[6]

Man must needs fall under the province of evolution, for otherwise evolution would not be true,[7] and accordingly, since his appearance on the earth, he has been the principal theatre for the play of its laws. He has developed not only various races, but chiefly various mind-products; society and its laws,[8] language,[9] morals,[10] and religions;[11] the laws of society and of moral conduct being identical, and springing from his inherited knowledge as to what is good for his race; and religion being a vague and cloudy structure, compounded of ignorance and fear, a state

[1] p. 137. [2] p. 5.
[3] Quoted by Mr. Clodd from Emerson, p. 135.
[4] p. 138. [5] p. 230. [6] p. 231. [7] p. 206.
[8] p. 211. [9] p. 216. [10] p. 218. [11] p. 214.

of error, through which it was necessary for him to pass on the road to truth,[1] the frenzy of the savage and the ecstasy of the saint having a common base in undisciplined imagination. Finally, truth has been reached in the doctrine of evolution: "from the action of mind on mind, has arisen that social evolution to which, in a supreme degree, is owing the progress of man in knowledge, whereby he has subdued the earth."[2]

It cannot be denied that here is a very ample bill of fare for our entertainment. Never, surely, was such a feast of reason promised to the mind of man, as is by this philosophy of the totality of things. Now shall we, at last, be enfranchised from the thraldom of mystery, and proudly stand, like Homer's warriors, looking forwards and backwards, our minds the monarchs of all they survey.

But it will, doubtless, be the part of prudence, first to examine on what basis all these pretensions rest; what bridges are afforded us to span the chasms over which we have to make our way, as we follow the course of things, from the beginning to the end. Nay, what about the beginning? Mr. Clodd calls his book *The Story of Creation;* but creation is precisely that which he does not tell us about, and about which he confesses he has nothing to tell: "the whence of the nebula and its potential life," being "an abiding mystery that overawes and baffles us."[3] "Of the beginning, of what was before the present state of things, we know nothing, and speculation about it is futile."[4] Nor only that: the beginning is, to the evolutionist, so hopeless a mystery, that he cannot even find a name for it, but must needs call it "creation," though creation evidently implies a Creator, and that is just what the whole story is meant to dispense with. Therefore, as the first stage in this supereminently rational inquiry, we must, like good little children, open our mouths, and shut our eyes, and swallow down the first bolus of mystery,

[1] p. 227. [2] p. 231. [3] p. 5. [4] p. 136.

and of mystery to which we postulate that there can never be a solution; either for our mind or for any other; since it is written: "Positive knowledge does not, and never can, fill the whole region of possible thought.[1] At the uttermost reach of discovery there arises, and must ever arise, the question, What lies beyond?"[2] Therefore, as Mr. Clodd naïvely confesses, to get to work at all, we must take things as we find them, and elect to begin somewhere. "Since everything points to the finite duration of the present universe, we must make a start somewhere. And we are therefore compelled to posit a primordial nebulous, non-luminous state, where the atoms, with their inherent[3] forces and energies stood apart from one another."[4] Which being interpreted means, that we must take for granted that matter existed; and existed in a state contrary to that whereto the exercise of its own forces tends to bring it. Its atoms were far apart to begin with: they have been drawing nearer and nearer to one another ever since.

Here, therefore, at the very first throw off, we experience a check, which promises to be final, and which must needs set us a-questioning our instructor. If he knows nothing about it, how comes he to be able to explain it all? Granting matter to be self-

[1] Verily this is a hard saying. "The region of possible thought" must be that in which thought is possible; and the region to which thought cannot penetrate, must be impossible to it. But thought penetrates a subject only by knowledge. Therefore, to say that knowledge cannot fill the region of possible thought, seems to be the same as saying that there is a region of possible thought wherein thought is impossible.

[2] Herbert Spencer, *First Principles*, p. 16. (3rd edition.) Quoted by Clodd, p. 5.

[3] "The word 'inherent' passes with some people for an explanation, but unfortunately it is the very thing that wants explaining. 'Inherent' only means sticking in, and nobody will doubt that if such a power once got into an atom it would be likely to stay there. . . . It is amazing that people in this boasting age of science should promulgate and accept such empty phrases as these for a solution of the problem of the origin of the laws of nature or the present state of the universe." (Lord Grimthorpe, *Origin of the Laws of Nature*, pp. 27, 28.)

[4] p. 137.

existent, an enormous concession, what about its forces? and what about its primordial state? The forces of nature could never have got it into that state, from which, as science demonstrates, they can only more and more remove it. Yet there the state was, and it requires to be accounted for. It is, moreover, the foundation of all that has since been made of matter; therefore, till it be explained, nothing is explained. That the teaching of science is as I have stated, we need not go far to show. "Astronomy," Professor Huxley tells us,[1] "leads us to contemplate phenomena the very nature of which demonstrates that they must have had a beginning, and that they must have an end." It is supposed, says Balfour Stewart,[2] that the particles of matter originally existed at a great distance from each other; and that, being endowed with the force of gravitation, they have since gradually come together, generating heat in the process; and that they will continue to approach one another, till further motion becomes impossible, and heat can no longer be produced. "The process goes on, and always in one direction."[3] The tendency, therefore, of the particles which make up matter, when left to themselves, is to come together: how came they at first to be apart? and as their being apart was necessary for all the work[4] ever to be done in the universe, we understand nothing till we understand this.

But we have, by no means, as yet got clear of our difficulties. It is very easy, and rhetorically very advantageous, to talk about "matter" as existing of itself, and endowed with forces, and with that still

[1] *Lay Sermons.* "On the adviseableness of imparting Natural Knowledge."

[2] *Conservation of Energy*, p. 151.

[3] The term *work* in scientific language designates the change of condition of a body, as from motion to rest or rest to motion, from one temperature to another, or from one chemical or electrical condition to another, as will be seen later.

[4] Balfour Stewart, *Conservation of Energy*, p. 142.

more convenient attribute, "potentialities." But what does this word "matter" stand for? Not for one thing, but for hundreds of millions of billions of totally distinct and independently existent atoms, each having its being of itself, without owing anything to any other; not to be changed or subdued by any force in nature. Through all change of circumstances and surroundings, Mr. Clodd tells us, an atom remains unchanged. "It matters not how many millions of years have elapsed during these changes, age cannot wither or weaken it; amidst all the fierce play of the mighty agencies to which it has been subjected, it remains unbroken and unworn:"[1] and it seems to him appropriate to apply to the atom the words of the Apostle, "The things which are not seen are eternal."[2] So stubborn, in fact, and untameable are these atoms, that, as Lord Grimthorpe has well remarked,[3] the materialist doctrine really means, "Every atom its own god." How, then, comes it, that they are so law-abiding a race? that they have combined to work out that order of the universe, which affects none of them one whit? that they have agreed, each to be like some atoms, and unlike others?[4] How in particular has it been arranged that their ceaseless jarrings and buffetings should produce the harmony we witness? For work is done in the universe only where there is resistance to force; and if the elements had not agreed to differ, and had not been in a condition to differ with effect, there could have been no heat, and no life upon the earth.

Such are a few of the difficulties which lie upon the threshold, over which we are invited to trip so easily, when we are asked to "posit" a primordial nebulous, non-luminous state, where atoms endowed

[1] p. 11. [2] p. 11.

[3] *Origin of the Laws of Nature*, p. 29.

[4] There are, so far as science knows, about seventy kinds of atoms, from which, as from letters of the alphabet, all material things are composed; as oxygen atoms, hydrogen atoms, carbon atoms, iron atoms.

with inherent forces and energies stood apart from one another; as being a simpler and plainer account of the matter than the old one, that "In the beginning God created the heavens and the earth."

But perhaps it is only the first step which is hard, and if we can make up our minds to jump blindfold across this preliminary abyss, we shall be rewarded by finding our lines laid in pleasant places on the further side. Let us try. After the genesis of matter, the next great problem which we have to face is the genesis of life. What explanation has the evolutionist to offer in regard of this? Alas! "The ultimate cause which, bringing certain lifeless bodies together, gives living matter as the result, is a profound mystery:"[1] that is all. Again, a gulf that may not be passed, yawns across our path; and again, just when we want him, our guide is as ignorant as ourselves; while the old story which he asks us to discredit in favour of his own, goes unfaltering on: "And God said: Let the earth bring forth the green herb, . . . and He said: Let the waters bring forth the creeping creature having life, and the fowl that may fly over the earth, . . . and let the earth bring forth the living creature in its kind. And it was so done."

As with life, so with Mind. We are assured over and over again, that it is only a form of matter, but when we come from assurances to demonstration, we must be fain to rest content with the soul-satisfying declaration that "the gulf between consciousness and the movement of the molecules of nerve-matter is impassable,"[2] or, as Professor Tyndall more elegantly puts it, "unthinkable."

What then, with all these monstrous limitations, are the credentials of the evolutionary creed? What is the purport of the evidence of that "cloud of witnesses," which, we are told, science brings to prove "the unbroken intercalation of all things"?[3] Truth to tell, nothing could more accurately describe

[1] p. 149. [2] p. 152. [3] p. 145.

the character of the testimony presented, than to call it a "cloud;" unless, indeed, it were to be called a "fog." The one fact given us, is the existence of evidence to show that various species of plants and animals have probably, or possibly, been developed one from another. This, so far as it goes, is matter for scientific treatment; and the theory of evolution, within the limits thus afforded, has a right to be called a scientific hypothesis. But, whether this portion of the theory be true or no, it assuredly does not furnish a foundation for a doctrine of evolution, extending to the "totality of things." Yet this is precisely what it is assumed to do. Taking it as proved that animals and plants have developed into fresh species, it is taken for granted that evolution is, therefore, a law, extending backwards into the inorganic world, and forwards into the mind of man. Yet nothing could be more utterly unlike, than the processes which are thus conveniently grouped under the one term of "evolution." Let it be a fact, that a fish has developed into a bird, because, in the struggle for existence, bird-like qualities enabled it to outlive other sons of fishes; what possible light does this throw on the question as to what induced atoms of oxygen, hydrogen, carbon, and nitrogen to combine into living tissue? The atoms gained nothing, as atoms, by so doing. *They* have no struggle for existence, for, as we have heard, they are eternal; they are as much atoms, and mere atoms of oxygen and nitrogen in the brain of a man, as in the vapours of a nebula; only that and nothing more. The one element, which is proclaimed to be the main-spring of organic evolution, is totally and absolutely wanting in the inorganic—the element of strife for survival. And on the other hand, nothing can be more diametrically opposed than the selfish struggle between individuals of the same species, to which, we are told, organic development is due, and the virtues which, since Christianity has been seen on earth, men have perforce agreed to esteem: charity, justice, and compassion. The struggle for

existence, on which Darwinism is built, so far as it has modified species, has been a struggle, not between creatures of different kinds, but between those of the same kind; the strong trampling out the weak, the robust crushing and exterminating the feeble. No individual animal or plant has ever, or is ever supposed to have, striven for the good of its race, but for its own; and it has benefited the race only by making itself, through successful struggle, a more vigorous progenitor for its own offspring. Yet because animals have thus struggled, the fittest always surviving, and making the weakliest go to the wall, we are asked to believe that man has, as their inheritor, naturally evolved the instinct of doing good to others, of self-conquest, of obedience,[1] of everything in short which is the exact opposite of the instincts whence his are said to be derived.

Yet this false analogy, founded on inexact and unscientific use of words, is absolutely the only shred presented to us, which can, even by courtesy, be called an attempt at proof. For the rest, there is nothing but bald assertion, bad science, and, above all, vague dithyrambic declamation, which, considered as poetry, is very poor stuff indeed, and, considered as philosophy, has absolutely no meaning. This last is indeed the war-horse of your evolutionist, and he always, while modestly proclaiming his weakness for "simple and plain language," contrives to spin for himself a web of phrases, in which we can find only what Hamlet found in the letter, Words, Words, Words. It seems in fact to be a maxim with such writers, that a difficulty is got over by describing it in terms coined from the Latin or the Greek—a sort of embossed type for the blind, the force of which, if not seen can at least be felt, like the blessed word Mesopotamia. From plain English they flee, as from the face of a serpent. The great prophet of evolution himself has set the

[1] p. 224.

example in the celebrated dictum, "Evolution is a change from an indefinite, incoherent, homogeneity, to a definite, coherent, heterogeneity, through continuous differentiations and integrations."[1] The disciples prove themselves apt imitators of the master. Take, for example, the following piece of demonstration concerning the distinction between living and lifeless matter.[2]

"Speaking relatively—for nothing is absolutely motionless—the crystal is stable, irresponsive: the cell is plastic, unstable, responsive, adapting itself to the slightest variation; it 'stoops to conquer,' and so undergoes ceaseless modification by interaction with its ever-changing environment. Life involves delicacy of construction; hence the transient nature of the organic in contrast to the abiding nature of the inorganic. And, strange as it may seem, separation is life; integration is death. For life is due to the sun's radiant energy, which, setting up separative movements, enables the plant to convert through its mysterious alchemy, the lifeless into the living, thus forming energetic compounds, which are used partly by the thrifty plant for its own vital needs, and largely by the spendthrift animal for its nutrition, to repair waste and maintain functions. Ultimately the energy thus derived from the sun, directly by the plant and indirectly by the animal, passes into space, and 'the dust returns to the earth as it was.' For life is only a local and temporary arrest of the universal movement towards equilibrium."

Of a truth, here is plain and simple language, adapted to the meanest capacity; and proving to demonstration the thesis, which it is brought to sustain, that "the origin of life is not a more

[1] Herbert Spencer, *First Principles*. Thus unfeelingly Englished by Mr. Kirkman: "Evolution is a change from a no-how-ish, untalkabout-able, all-alikeness, to a some-how-ish, and in-general-talkabout-able, not-all-alikeness, through continuous something-else-ifications and stick-together-ations."

[2] p. 151.

stupendous problem than the origin of water."[1] Surely, if clear utterance denotes clear thinking, we have it given us to drink a crystalline draught of thought.

But the writer has not in the foregoing passage put forth all his strength. Here is another, pitched in a higher key, of the style I call dithyrambic. It is designed to do away with the slight difficulty presented by the fact, that the machinery of the universe is found by science to be running down like a clock, that the inevitable end of all life is seen to be approaching, and that the phenomena, from which we learn this, tell us also that there was a definite beginning. "The ultimate transference of all energy to the ethereal medium, involves the end of the existing state of things. But the ceaseless redistribution of matter, force-clasped and energy-riven, involves the beginning of another state of things. So the changes are rung on evolution and dissolution, on the birth and death of stellar systems—gas to solid, solid to gas, yet never quite the same—mighty rhythmic beats, of which the earth's cycles, and the cradles and graves of her children, are minor rhythms."[2]

This is certainly pretty well for a man who confesses that he knows nothing of what he is talking about, that "of what was before the present state of things, of what will follow the end of it, we know nothing, and speculation is futile:"[3] for through the nebulous, non-luminous stuff, of which, like his primeval universe, our author's explanations are composed, there glimmers unmistakably the assertion, decently wreathed in vapourings to veil its crude absurdity, that there never was a beginning and never will be an end; that the teaching of science is, "One universe down, and another come on."

[1] P. 150. The origin of life is on p. 149 "a profound mystery." Here "it hides no profounder mystery than the lifeless." On p. 230 it is fully explained by calling the combinations of elements producing it "subtile." [2] p. 231. [3] p. 136.

Till I read such productions as this, I used to fancy that the author of *Dombey and Son* had overpassed the limits of caricature, in the speech assigned to Captain Bunsby. I now conceive this great man to have been an evolutionist, evolved before his time, and his oracle as to the likelihood of a certain son and heir having gone down, to be a foreshadowing of the pronouncement of sages as to the coming up of the son and heir of evolutionary ages. "What I say, I stand to. Whereby. Why not? Do I believe he's gone down? Mayhap. Do I say so? Which? A skipper isn't forced to run upon the Goodwins. But he may. The bearing of this observation lays in the application on it. That ain't no part of my duty. Avast then: keep a bright look out, and good luck to you."

To take one more specimen of what the old Areopagites called "word-scattering," which common folk call "talkee-talkee," and evolutionist philosophers call "proof." Let it be this time the supply of an acknowledged want in evolutionary machinery that serves as a sample.[1]

"Professor Huxley says, that 'the great need of the doctrine of evolution is a theory of variation.' When, however, we consider the minute complexity of structure of living things invisible to the naked eye, and their response to every shiver of energy from without, we have sufficing factors to produce unstableness, which will result in unlikeness of parts. Given a body which, although a minute speck, contains billions of molecules performing complicated movements of immense rapidity, and sensible in an inconceivable degree to the play of vibrations impinging upon them at the rate of hundreds of trillions per second, would not the marvel be if these quivering particles of the structure, shaken by energies within, and by still more potent energies without, did not undergo continuous redistribution?"

From this style of argument it would appear, so far as it is possible to attach to it any meaning

[1] p. 162.

whatever, that a sledge-hammer being a sufficing factor "to produce unstableness" in a lever watch, it would be a marvel if it did not convert it into an eight-day clock. Is not this sort of thing worth translating, for the benefit of Finns and Sekwanas? and a boon whereof school-children should by no means be defrauded?

The field we have been exploring is so vast, that, to get on at all, we must take a hint from Mr. Clodd, and elect to make an end somewhere: so I will content myself with these specimens, albeit there are finer to be found, proceeding at once to another point, whereto some of the above-quoted utterances will serve to introduce us.

Many of my readers will doubtless have been puzzled by Mr. Clodd's use of the term "Energy," and puzzled they well may be, for thereby hangs an extraordinary tale. The great obstacle which science throws in the way of the eternity of the universe, of that mighty rhythmic beat and those misty cycles, chanted by Mr. Clodd, is the doctrine of the Conservation of Energy. According to this, which now takes rank among physicists with the doctrine of gravitation, energy is defined as the power of doing work, and work is done when the state of a body is changed. Work is done in the impact of a rifle-bullet upon a target by the heat and change of form that results in both. The sun does work upon a pool of water by vaporizing it, or upon a lump of ice by melting it. Work is done in the burning of a candle, in the first place by chemical combination between its carbon and the oxygen of the air, and then by evolution of heat in the process. Work is likewise done when a stick of sealing-wax is rubbed on a cloth and becomes electrified, and it can then do the work of electrifying another body, or of moving such objects as scraps of paper, or pith-balls. It is thus evident that one sort of energy can be changed into another: motion, into heat or electricity, and *vice versa*. Moreover, energy can exist in two conditions, kinetic and potential. Kinetic energy is

the energy of movement, potential energy that of position. The rifle-ball flying to the target has kinetic energy only—it can do work only because it is in motion. The water in a mill-reservoir has energy of position only—it can do work because it has been raised up against gravity, and because gravity will pull it down again when it has the chance, and so enable it to do work by turning the mill-wheel. Energy, therefore, is to be found in a body, only when work has been done upon that body; on the bullet by the explosion of gunpowder; on the water by the sun's evaporation, or the pressure of other water, or the pumping of a steam-engine. Therefore energy, as we know it, is the product of force: and it is always expended in doing work. Another important point of the doctrine is that though the sum of energy, in the universe, is constant, the sum of energy available for work is growing continually less. The energy of motion can be entirely converted into heat, but heat cannot be entirely converted back into motion; from which it must inevitably come to pass that heat will supplant motion and become the form of energy dominant in the universe. But heat, in the first place, never brings all its force into play to do work. Much of it is radiated into space, into what Mr. Clodd calls the ethereal medium, and does no work, because it finds nothing to act upon.[1] In the second place, heat can do work only between bodies of dif-

[1] "Universally diffused heat forms what may be called the great waste-heap of the Universe, and this is growing larger year by year." (Balfour Stewart, *Conservation of Energy*, p. 153.)

I am aware that Professor Crooke, whose authority as a chemist is very great, has, with the sanction of Professor Stacey, suggested a theory to meet the difficulty thus presented; namely, that the heat radiated to the confines of space there generates new operative energy and brings it back thence into the universe, thus keeping the store of available energy ever up to the same level, and that he says, "Hence Sir W.Thomson's startling prediction falls to the ground." (See the *Times*, April 4, 1888.)

But I observe that he speaks of this only as "hazarding a conjecture," and of the work being done "by some process of nature not yet known to us." It is clear, therefore, that the

ferent temperature; once obtain thermal equilibrium between two bodies, and they can no more do work upon each other, than two ponds at the same level can establish a mill-race between them. As heat always tends to produce such equilibrium, the warmer body heating the cooler, and that cooling the other, by absorbing more heat than it returns, it follows that the time is coming on when heat can do work no more, and when, mechanical energy being changed into universally diffused heat, "the universe will no longer be a fit abode for living beings."[1]

It is by this line of argument that science demonstrates the essentially finite nature of the present state of things. The end, as we see, is inevitable, and no less obvious is it that there was a definite beginning. If the machine of the universe is ever spending its working energy, it cannot have been going for ever, or the energy would have been expended long ago.[2] It is clear that, when the

theory gains nothing from his authority as a chemist, and this is a case wherein is apposite the remark of Lord Rayleigh.

"It would be easy to lay too much stress upon the opinion even of such distinguished workers as these. Men, who devote their lives to investigation, cultivate a love of truth for its own sake, and endeavour to clear up, and not, as is too often the object in business and politics, to obscure a difficult question. So far the opinion of a scientific worker may have a special value; but I do not think that he has a claim, superior to that of other educated men, to assume the attitude of a prophet. In his heart he knows that underneath the theories he constructs there lie contradictions he cannot reconcile. The higher mysteries of being, if penetrable at all by human intellect, require other weapons than those of calculation and experiment." (*Presidential Address to the British Association*, 1884.)

[1] Balfour Stewart, *Conservation of Energy*, p. 142.

[2] "It has been well pointed out by Thomson, that, looked at in this light, the universe is a system that had a beginning and must have an end; for a process of degradation cannot be eternal. If we could view the universe as a candle not lit, then it is perhaps conceivable to regard it as having been always in existence; but if we regard it rather as a candle that has been lit, we become absolutely certain that it cannot have been burning from eternity, and that a time will come when it will cease to burn." (Balfour Stewart, *Conservation of Energy*, p. 153.)

machine was first endowed with energy, it not only got that sum which it now possesses, but got it in a highly advantageous form; probably, so far as science can tell, in the form of very violent motions, since toned down in the production of heat and electricity. If we are, as a start, to "posit" atoms at great distances from one another, we must either suppose that they were posited there by some one; or that there is a natural force that can drive them apart, against the action of gravity tending to draw them together, and, in fact, drawing them continually together more and more. Once get the atoms apart, and no doubt we get the potentiality of plenty of motion, from the power of gravity; just as when we get a mass of water into a tank on a hill. But where is the power which is to do this work? Hitherto it has been unknown to science.

Such a power being, however, a necessity of evolutionary theory, it has, in accordance with the fitness of things, been itself evolved by Mr. Clodd, with the assistance of Mr. Grant Allen. They felt "the difficulty arising from the lack of precision in standard books on physics, in the use of the terms 'force' and 'energy,'" and determined to meet it, by giving "rigid and definite meanings" to the terms, so as to afford "a clearer conception of cosmic dynamics." A precious theory it is that this pair of philosophers have excogitated, and employment of their "rigid and definite" meanings of terms, would ensure the plucking of a schoolboy at the hands of any examiner who knew his business. In brief, their novel doctrine is this. Energy, instead of being a product of Force, is an independent and antagonistic Power counteracting the work of Force; belonging to matter, but not inherent in it, whatever that may mean, and capable of being passed about from one particle to another, like the one eye and one tooth which the Grey Sisters had amongst the trio, or like the books in Mudie's Library. Energy tends to separate bodies, as Force to draw them together. "Force is the attracting or pulling power;

Energy is the repelling or pushing power, and by the antagonism of these the work of the universe is done."[1] "If Force had unresisted play, all the atoms in the universe would gravitate to a common centre, and ultimately form a perfect sphere in which no life would exist, and in which no work would be done. If Energy had unresisted play, the atoms in the universe would be driven asunder and remain for ever separated, with the like result of changeless powerlessness. But with these two powers in conflict, like the Ahriman and Ormuzd of the old Persian religion, the universe is the theatre of ceaseless redistribution of its contents, whether in the sweep of the stars and their attendant systems through space, or in the pendulum-like vibration of the invisible particles of every body, or in the throbs of the ethereal medium."[2] It is the introduction of this sort of Energy that renders the mechanics of the process of making worlds "not difficult of explanation." And the explanation of the process runs thus:

"The Force bound up in each atom, acting as affinity, combined the atoms as molecules; acting as cohesion, it united the molecules into masses; acting as gravitation, it drew the masses towards their several centres of gravity. As the atoms rushed together, Energy, which had hitherto existed in a state of rest as passive separation, became active in *molar* and *molecular* form. As *molar* energy, IT IMPARTED MOTION TO EACH MASS[3]—a motion of rotation on its own axis and motion in an orbit. As *molecular* energy, it IMPARTED a rapid vibratory, backwards and forwards MOTION to the molecules."[4] This Energy is, therefore, a highly convenient factor for evolutionary purposes in cosmic dynamics. The only difficulty is that it is not only unknown to

[1] p. 14.

[2] p. 14. It is perhaps worthy of note that a few pages earlier (p. 7) the existence of this ethereal medium is only a "probability."

[3] The emphasis in these words is mine. The italics are the author's.

[4] p. 138.

science, but is directly opposed to those laws on which physical science rests. The first of Newton's great laws is that a body at rest will continue at rest unless moved from outside, as it will, if in motion, continue in motion unless similarly stopped. But here is a power (Mr. Clodd will not allow us to call it a force) whereby a body moves itself, and he asks us to believe that if the moon does not fall upon the earth it is because this inherent[1] energy holds it off, not because its orbital velocity is the resultant of the various attractive forces to which it has been subjected. Mr. Clodd's Energy is much of a piece with that to which Mr. John Morley has given countenance,[2] and which Baron Holbach imagined. "Motion," the Baron taught, "is a fashion of being which flows necessarily from the essence of matter." The doctrine thus stated does not need the authority of Newton to condemn it. A "tendency to move" is inconceivable without a definite direction in which that tendency lies. The tendency of a particle to move indefinitely in all directions is equivalent to a tendency to stop where it is, like a donkey between innumerable bundles of hay. And how is the particle to get from itself a preference for one direction over another, when all are, for its private purposes, one as good as another?

It must also be remembered that there are repulsive forces known to science, such as that of the magnet. But these are true forces, acting according to the laws of force, not according to that of energy; but constantly existent and active, not spent, like energy, in doing work. Such forces Mr. Clodd apparently finds so repulsive that he never mentions them; they are conspicuous by their absence from his tabular summary of forces and energies. Are they absent because he knows nothing about them? or because their presence would be inconvenient, as

[1] Athough energy is, on p. 13, stated to be inherent in matter, yet, as on p. 137, energies *are* inherent, I conceive myself to be justified in using the term.

[2] *Fortnightly Review*, August, 1878.

upsetting his rigid and definite definitions, of force as a pulling, and of energy as a pushing power? In either case it is a serious matter for an instructor to make such a mistake, who is so desperately anxious to teach everybody.[1]

Thus, then, is evolutionist machinery manufactured, and the spectacle is not only an edifying one, but instructive too. If such wild attempts are made to fill the gap, it shows that there is a gap to be filled, and that the properties of matter do not suffice to fill it. Energy there must be, to be sure, somewhere, to account for the fact that the machine of the universe works, but science has availed to show that it cannot be the energy of material force alone. No tinkering with terms, no new and rigid definitions of meanings, will suffice to supply the void.[2] With Mr. Herbert Spencer himself we are

[1] There is also another new wheel to the coach in the shape of electrical units, though what these may happen to be must be left to be gathered from Mr. Clodd's own note: "This concept of electrical units, which may be the equivalent of polarity of the atom, is here added merely as a convenient mode of envisaging a certain order of phenomena." (p. 17.)

[2] Since this paper was written, Mr. Grant Allen's work on this subject has been reviewed in *Nature* by Professor O. J. Lodge. (January 24, 1889, pp. 289, seq.) From this review I extract the following passage: "There exists a certain class of mind, allied perhaps to the ancient Greek Sophist variety, to which ignorance of a subject offers no sufficient obstacle to the composition of a treatise upon it. It may be rash to suggest that this type of mind is well developed in philosophers of the Spencerian school, though it would be possible to adduce some evidence in support of such a suggestion.

"In the volume before us, Mr. Grant Allen sets to work to reconstruct the fundamental science of dynamics, an edifice, which since the time of Galileo and Newton, has been standing on what has seemed a fairly secure and substantial basis, but which he seems to think it is now time to demolish in order to make room for a newly excogitated theory. The attempt is audacious, and the result—what might have been expected. The performance lends itself to the most scathing criticism; blunders and misstatements abound on nearly every page, and the whole structure is simply an emanation of mental fog. . . . The puzzle (of the moon's centrifugal motion) was solved completely long ago, in the clearest possible manner, and the 'Principia' is the witness to it; but it is still felt to be a

brought to the conclusion, that "amid the mysteries which become the more mysterious the more they are thought about, there will remain the one absolute certainty, that we are ever in presence of an Infinite Eternal Energy, from which all things proceed."[1]

This brings us to the last point, which at present I propose to treat, and the most fundamental of all. What can we know beyond the objects of sense? Can we ascend from the seen to the unseen? Mr. Clodd is very positive that we can not, and that any attempt to do so violates the fundamental principles of right reason. His arguments on the subject are exactly represented by those of Professor Paul Darnley in Mr. Mallock's clever extravaganza.[2] "He first proclaimed to his hearers the great primary axiom in which all modern thought roots itself. He told them that there was but one order of things, it was so much neater than two; and if we would be certain of anything, we must never doubt it. Thus, since countless things exist that the senses can take account of, it is evident that nothing exists that the senses cannot take account of. The senses can take no account of God; therefore God does not exist. Men of science can only see theology in a ridiculous

difficulty by beginners, and I suppose there is no offence in applying this harmless epithet to both Mr. Grant Allen and Mr. Clodd, so far as the truths of dynamics and physics are concerned. . . . His difficulties about understanding normal acceleration and the generality of Newton's second law were natural and excusable, though hardly the subject to write a book about. . . . The thing which strikes one most forcibly about the physics of these paper philosophers is the extraordinary contempt which, if they are consistent, they must or ought to feel for men of science. If Newton, and Lagrange, and Gauss, and Thomson, to say nothing of smaller men, have muddled away their brains in concocting a scheme of dynamics wherein the very definitions are all wrong; if they have arrived at a law of conservation of energy without knowing what the word energy means, or how to define it; if they have to be set right by an amateur who has devoted a few weeks or months to the subject, and acquired a rude smattering of some of its terms—what intolerable fools they must all be!"

[1] *Nineteenth Century*, January, 1884, p. 12.

[2] *Positivism on a Island; or, The New Paul and Virginia.*

light; therefore theology has no side that is not ridiculous." Similarly Mr. Clodd, on the ground that our senses can take no account of anything but the changes of matter, pronounces that to say there can be substance which is immaterial, is "the unverifiable assumption of dogmatic theology,"[1] and, as he elsewhere declares that "a dogma learned is only a new error," it is plain that theology deals only with fable.

The province of our reason, in fact, comes to an end, he assures us, with the visible, the ponderable, and the measurable. "Beyond that barrier we cannot go. We can neither affirm nor deny; we can only confess ignorance."

But it is obvious that ignorance is just what he does not confess. There are indeed acknowledged gulfs of mystery in his way, but he knows all about what there is on either side of them, and across them into the bargain, of that "unbroken intercalation of things," which extends from end to end of the world's history; he knows, for he has told us, how worlds were formed; that the living differ from the non-living only in the mixing of its particles;[2] that man is identical, as to "the stuff of which he is made," with the meanest flower that blows; that there is nothing in him which is no part of the material contents of the universe, and no free-will which lies outside the range of its causation;[3] and that his mind is but a product of matter and material power, being nowise different in kind from the structureless jellies which are the lowest form of life,[4] and to which he finds applicable the description by Scripture applied to the Almighty, "Thou art the same, and Thy years shall have no end."[5] In a word, "Thought and emotion are as completely within the range of causation, and as capable of mechanical explanation, as material phenomena,[6] although language marks the impassable gulf between the mental capacity of man and every other animal."[7]

[1] p. 152. [2] p. 149. [3] p. 206.
[4] p. 230. [5] p. 158. [6] p. 6. [7] p. 215.

It thus appears that though the assumed limitations of our knowledge will serve, as well as any other stick, to beat the theological dog, they are altogether inoperative to control evolutionary dogmatism. But what is to be said as to the assumed limitation? Is it true that we can argue from the seen only to the visible? Do we violate any rule of reason in deducing an unseen cause from an observed effect, or the existence of that which is not subject to the laws of matter, from a study of those laws?

It is in the first place clear that no one does or can limit the province of his knowledge by the range of his senses, and that evolutionists do so least of all. To say nothing of that chimerical energy whereof we have heard, who has ever seen or felt or weighed force? We talk about gravitation, and assume its existence as a sort of axiom, yet what have we to show in proof of our belief? Simply the fact that bodies are observed to tend to come together, according to a law which nothing else we can imagine will explain. And it does not matter that the theory of gravitation is beset by such difficulties, as to make Sir John Herschel call it "the mystery of mysteries," and Faraday consider it an evident paradox. There are the facts, and they must have some explanation, and this explanation is at least less difficult than any other. So again of the luminiferous ether, Mr. Clodd's "ethereal medium," we have no proof whatever that there is such a thing, except the fact that there is such a thing as light, and that we can account in no other way for light being possible. And yet we are, for various reasons, compelled to attribute to this substance qualities which to the experience of our senses seem absolutely contradictory. It is so much thinner than the thinnest gas as to offer no resistance whatever to planets ploughing their way through it; yet it is not a gas, nor even a liquid, but a solid, at least as solid as a jelly.[1] Whence again, except

[1] See Lord Grimthorpe's *Origin of the Laws of Nature*, p. 31.

from such process of reasoning from effect to cause, can we know anything about those potencies or potentialities of matter, in which good evolutionists so devoutly believe? How does Mr. Clodd know that his primordial nebulous stuff "held latent within its diffused vapours all that through work of man for good or ill, has composed the warp and the woof of this world's strange eventful story,"[1] or in plain English, man and all his works? He himself, in fact, tells us in many places that this is the method of argument on which science rests. Thus, for his cosmic dynamics, it is necessary, not only that atoms should be posited far apart, but that they should be posited irregularly, so as to provide different densities of matter. Why so? Because "on no other theory is its segregation into a multitude of bodies explicable."[2] So again the great theory of the conservation of energy "does not admit of demonstration, but justifies itself as the only tenable explanation of the several states and distribution of bodies in space."[3] And have we not been told, in terms as clear as those of the oracle at Delphi, that electrical units are but a concept, introduced as a convenient mode of envisaging phenomena?[4]

It is therefore plain that error lies not with him who argues from the sensible to what is beyond sense, but with him who argues wrongly, who professes to find a conclusion in premisses which do not contain it, or attributes effects to a cause which could not produce them. Mr. Clodd tells us[5] that "'The Law of Parsimony' forbids us to invoke the operation of higher causes to account for effects which lower causes suffice to explain." But there is a still more stringent law telling us that every effect must have a sufficient cause, and that if a lower cause be insufficient, we are therefore compelled to admit a higher, even though that higher cause, in its own nature, be beyond the scope of our

[1] p. 5. [2] p. 141. [3] p. 140. [4] p. 17. [5] p. 149.

intellect. If material causes be inadequate, to explain the effects we observe in matter, we are led by sheer necessity to the recognition of a cause which is not material. And that material causes are inadequate, as a basis for the philosophy of the universe, is just what science proves. When men knew less about matter and its laws, it was conceivable that they should attribute to matter the powers which were needed for the beginning of things, and imagine the fire, or the wind, or the swift air, or the circle of the stars, or the great water, or the sun, or the moon,[1] to be the ultimate rulers of the universe; though even long ago it was taken to be the part of wisdom bluntly to call such men fools. But now that physical science has been developed, we may say of such beliefs, as Mr. Clodd says of theology, that they are begotten of sheer ignorance. We know enough about the laws of matter to be able to say not only what it can do, but also what it cannot. We know its laws of motion, of crystallization, of chemical combination, sufficiently at least to be assured that it cannot break them, and to be able to foretell what it will inevitably do in given circumstances. We have in fact pried so far into its constitution as to know not only what is there, but what is not there, and to be assured that it does not contain the First Cause.

To take an example. In an egg, which is the type of the physical origin of all animal life, not only do we not find any of those parts, muscle, nerve, or bone, which, in suitable conditions, are thence developed, but the microscope demonstrates their non-existence. Neither are they introduced from without. Yet in the egg they are bound to appear. We know exactly of what elements the egg-contents are composed, how much oxygen, how much hydrogen, how much nitrogen. We can blend them in those proportions accurately for ourselves; yet cannot all the powers of science make an egg that shall hatch

[1] Wisdom xiii. 2.

so much as a tadpole.[1] It is evident that there is a something present which the science that deals with matter cannot detect, and this something is the real cause of the developments ensuing, and determines them in the definite directions they assume, "whether it is to be a mollusk, a frog, or a mammal, that is to be developed from apparently identical primitive cells."[2]

This problem is of course, according to his wont, airily solved by our evolutionist. "The answer obviously is that, *the ingredients being the same, the difference must lie in the mixing.*"[3] But take the eggs of a hen and of a duck. The microscope shows that there is no difference in the mixing, that there is absolutely no distinction in their contents, whereof science can take account. Yet inevitably the potentiality of swimming and quacking lies dormant in the one, and of sparring and crowing in the other. Does not science teach us rather to say that the difference must lie in the Mixer?

Such, at any rate, is the conclusion of some philosophers who are not unworthy of the title of scientific men, and in whose company we need not be ashamed to stand, even in the face of the cloud of witnesses whom evolutionists claim to produce.

"To treat of God," says Newton, "as a deduction

[1] "It is true that there are those who profess to foresee that the day will arrive when the chemist, by a succession of constructive efforts, may pass beyond albumen, and gather the elements of lifeless matter into a living structure. Whatever may be said of this from other standpoints, the chemist can only say that at present no such problem lies within his province. Protoplasm, with which the simplest manifestations of life are associated, is not a compound, but a structure built up of compounds. The chemist may successfully synthesize any of its component compounds, but he has no more reason to look forward to the synthetic production of the structure, than to imagine that the synthesis of gallic acid leads to the artificial production of gall-nuts." (Sir H. Roscoe, *Presidential Address, British Association*, 1887.)

[2] Mr. St. George Mivart.

[3] p. 149. The italics are Mr. Clodd's.

from what we see, is a part of natural philosophy."[1] "The whole variety of created things could arise only from the design and the will of a Being existing of Himself.[2] This exact machinery of sun, planets, and comets, could not originate except from the plan and the power of an intelligent and mighty Being."[3]

But perhaps Newton's ideas are out of date, and the scientific world has unanimously transferred its allegiance to Mr. Darwin and Mr. Spencer. Let us hear Sir G. Stokes, now President of the Royal Society. "The theory [of Darwin] has been accepted by many eminent biologists with a readiness that is puzzling to an outsider, especially one accustomed to the severe demands for evidence that are required in the physical sciences."[4] "We have evidence in the commencement of life on earth, of the operation, in time, of a cause, which, for anything that we can see, or that appears probable, lies altogether outside the ken of science."[5] "When we contemplate all this" [the phenomena of light], "it seems difficult to understand how we can fail to be impressed with the evidence of design thus imparted to us. But design is altogether unmeaning without a designing mind. The study then of the phenomena of nature leads us to the contemplation of a Being from whom proceeded the orderly arrangement of natural things that we behold."[6]

Professors Stewart and Tait are likewise blankly unconscious of the limitations of our knowledge as formulated by Mr. Clodd. "We assume, as absolutely self-evident, the existence of a Deity, who is

[1] "Hæc de Deo, de quo utique ex phaenomenis disserere, ad philosophiam naturalem pertinet." (*Principia. Scholium generale.*)

[2] "Tota rerum conditarum pro locis et temporibus diversitas, ab ideis et voluntate entis necessario existentis solummodo oriri potuit." (*Ibid.*)

[3] "Elegantissima hæcce solis, planetarum et cometarum compages, non nisi consilio et dominio entis intelligentis et potentis oriri potuit."

[4] *Address to the Derby Church Congress*, 1882.

[5] *Burnett Lectures*, p. 327. [6] *Ibid.* pp. 334, 335.

the Creator and Upholder of all things,"[1] and Professor Tait throws in another remark which must not be omitted. "When the purposely vague statements of the materialists and agnostics are stripped of the tinsel of high-flown and unintelligible language, the eyes of the thoughtless, who have accepted them on authority, are at last opened, and they are ready to exclaim with Titania, 'Methinks I was enamoured with an ass.'"[2]

A like disregard for evolutionary canons of thought is displayed by Sir William Thomson, who has been such a sore trouble to evolutionists from Mr. Darwin himself onwards. He tells us that "overpowering proofs of intelligence and benevolent design lie around us: showing to us through Nature the influence of a free-will, and teaching us that all living beings depend upon one ever-acting Creator and Ruler."[3]

In the same sense speaks another President of the British Association, Sir William Siemens. "We find that all knowledge must lead up to one great result, that of an intelligent recognition of the Creator through His works."[4]

And a third President, Lord Rayleigh, is cruel enough to notice not only the argument which leads to this conclusion, but its opponents. "Many excellent people are afraid of science as tending towards materialism. That such apprehension should exist is not surprising, for unfortunately there are writers, speaking in the name of science, who have set themselves to foster it. It is true that amongst scientific men, as in other classes, crude views are to be met with as to the deeper things of Nature; but that the life-long beliefs of Newton, of Faraday, and of Maxwell, are inconsistent with the scientific habit of mind, is surely a proposition which I need not pause to refute.'

Sir John Herschel is another who has a right to

[1] *The Unseen Universe*, p. 47.
[2] *Nature*, July 17, 1879. [3] *Presidential Address*, 1882.
[4] *Presidential Address*, 1884.

bear witness on behalf of science, an authority whose opinion of the Darwinian theory its author was most anxious to know, and was bitterly disappointed to learn. At his hands the easy explanation of world formations, already presented to us, finds scant sympathy. This is his irreverent account of it:

"In the beginning was nebulous matter, or *Akasch*. Its boundless and tumultuous waves heaved in chaotic wildness, and all was oxygen and hydrogen, and electricity. Such a state of things could not possibly continue; and as it could not possibly be worse, alteration was here synonymous with improvement."

"The relations in which atoms stand to one another are anything but simple ones. They involve all the 'ologies,' and all the 'ometries,' and in these days we know something of what that implies. Their movements and interchanges, their 'hates and loves,' their 'attractions and repulsions,' their 'correlations,' their what not, are all determined on the very instant. There is no hesitation, no blundering, no trial and error. A problem of dynamics that would drive Lagrange mad, is solved *instanter*. *Solvitur ambulando*. A differential equation which, algebraically written out, would belt the earth, is integrated in an eye-twinkle; and all the numerical calculation worked out in a way to frighten Zerah Colburn, George Bidder, or Jedediah Buxton. In short, these atoms are most wonderful little creatures."

And he goes on: "*The presence of* MIND is what solves the whole difficulty: so far, at least, as it brings it within the sphere of our own consciousness, and into conformity with our own experience of *what action* is."[1]

"Will without Motive, Power without Design, Thought opposed to Reason, would be admirable in explaining a chaos, but would render little aid in accounting for anything else."[2]

[1] *Familiar Lectures*, pp. 457, 458. The italics, &c., are his.
[2] *Ibid.* p. 475.

In a similar strain speaks Sir J. W. Dawson for Geology.[1] "There are certain principles to which we may firmly hold without fear of being dislodged by any assailant. First: No system of the universe can dispense with a First Cause, eternal and self-existent; and the First Cause must necessarily be the living God, whose will is the ultimate force and the origin of natural law." And again:[2] "The reason of man is an actual illustration of mind and will as an efficient power in nature, and implies a creative mind. The inherent absurdity of the evolution of powers and properties from things in which they are not even potentially contained, appear nowhere more clearly than here."

We must again determine to make an end somewhere, so these are a part, by no means the whole, of the testimonies that might be adduced. The voice with which they speak is that of common sense enlightened by science. We know better nowadays than to fancy that Tenterden steeple can be the cause of the Goodwin Sands, and we ought to know better than to think that the attractions and affinities of oxygen and carbon can have produced Hamlet, or the Dresden Madonna, or the precept, "Thou shalt love thy neighbour as thyself;" and to know better, therefore, than to believe that "all that is, from fire-fused rock to the genius of man, was wrapped up in primordial matter."[3] I say we *ought*, for we have faculties to use them, and this conclusion is so natural to the human mind that there can be no excuse for missing it. Nothing can be got out of a sack, but what is in it, nor out of a nebula. If there now be in the world, goodness, beauty, and truth, they must have been from the beginning, and what we see in Nature must be the manifestation of what has ever been. Therefore has it been said that the invisible things of the world are so manifested by the visible, as to make those inexcusable who remain in ignorance concerning them.

[1] *Modern Ideas of Evolution*, p. 228. [2] *Ibid.* p. 201. [3] p. 137.

What are we to say of those who in the interests of an otherwise unworkable theory, upset the fundamental laws of science, and, wrapping up crude notions, and baseless speculations, in the tinsel of high-flown and unintelligible language, scatter it among the young and the ignorant, who can learn from it only one clear doctrine, that there is no such thing as right or wrong; that morals are a convention, relative not absolute;[1] that where there is no society there can be no sin;[2] that, consequently, what society condones ceases to be sin, and that, among ourselves, seduction is in that case?[3] How is the passion of youth likely to interpret Mr. Clodd's jubilant pæan, "What dead weight of care do morals thus regarded lift from the heart of man!"[4]

"These be thy gods, O Israel!" It is of vapid and vapouring stuff like this that the idol is constructed, which we are bidden to fall down and worship, to the tune of the trumpet and the cornet and the flute, of the sackbut and the psaltery and the symphony, and all kinds of wind instruments, assiduously puffed by those, whose assumption to speak in her name, as Lord Rayleigh has told us, is a misfortune for science. Unhappily a cuckoo-cry is easily caught up, and becomes effective by its mere repetition, like that of the bird itself,

> Whose note full many a man doth mark,
> And dares not answer Nay.

But whether the creed, as we have seen it presented, have any shred of science to recommend it, readers will judge for themselves.

[1] p. 220. [2] p. 218.
[3] p. 220. It is impossible to get any other meaning out of Mr. Clodd's words.
[4] p. 222.

The Voices of Babel.

If one thing should be clearer than another to students of modern scientific literature, it is that the philosophers of our generation are in process of building an edifice more enduring than bronze, and more lofty, not only than the ancient pyramids of kings, but than anything that men or demigods ever yet contrived to rear upon the earth. Never before has arch-contriving man succeeded in raising himself to so lofty a perch, to one whence he can, with eagle glance, take in every nook and cranny of the universe. The old race, who thought to get to regions of empyrean light by use of brick and mortar, the giants who, with like intent, piled Ossa on Olympus, and leaf-shaking Pelion upon both—these indeed failed, and deserved to fail, because they used so clumsy and unintelligent a machinery. But the work they ambitioned can be done, and we are doing it. The unceasing discoveries of science not only give us knowledge of the facts of nature, but, cemented and compacted by exact thought, grow into a stately pile which has already pierced the clouds and vapours, hitherto bounding mortal vision, and shown us what is above them, or more truly what is not. For the great net result of discovery in these sublime regions is assuredly this, that they are empty and void, containing nothing of all that with which human ignorance has credited them hitherto. All proves to be as unsubstantial as the baseless fabric of a dream, except only the tower of science, and the solid earth

of material facts whereon its base reposes. There is no God in sight beyond, no power, no will, no mind. Heaven has been taken by storm, in the sense that the light of knowledge has been cast into its recesses, and they have been found to be empty; and men need therefore trouble themselves no more about anything there, or about anything that professes to issue thence.

Such is undoubtedly the purport of the despatches that come floating down to us humbler mortals, who have had no hand in the edifice, as we still plod our accustomed ways beneath, from those whom we understand to be on its summit. He who may claim to be the very mast-head man, "Our great philosopher," Mr. Herbert Spencer, "the only man in England who can lay claim to the title; the only man in Europe now living who has constructed a real system of philosophy,"[1] "The Apostle of the Understanding,"[2] proclaims to us in words, which would appear to have got somewhat mixed with cloud in coming down, that "difficulties, some of which are often discussed, but never disposed of, must force men hereafter to drop the higher anthropomorphic characters given to the First Cause, as they have long since dropped the lower. The conception which has been enlarging from the beginning must go on enlarging, until, by disappearance of its limits, it becomes a consciousness which transcends the forms of distinct thought, though it ever remains a consciousness."[3] In other words, and perhaps more plainly, none of the faculties we know in man are to be found in the world beyond, neither intelligence nor free-will; as the tower has grown, this has become the more obvious, and the highest object of our thought is one we cannot think about.

The line of argument by which this conclusion is reached, with which argument I am not now concerned, is enthusiastically welcomed by Mr. Frederick

[1] Mr. F. Harrison, *Nineteenth Century*, Sept. 1884, p. 354.
[2] Professor Kingdon Clifford, *Essays*, p. 417.
[3] *Nineteenth Century*, Jan. 1884, p. 8.

Harrison as absolutely unanswerable, and as the last word in the controversy with theology. "That word," he assures us, "is decisive, and it is hard to conceive how theology can rally for another bout, from such a *sorites* of dilemma as is there presented."[1] In fact, to sum up what does not require proof, in the words of one who, at any rate, had the full courage of his opinions, and expressed them in terms the clearest he could command, it is generally agreed amongst "philosophic thinkers," that Professor Clifford spoke truly when he declared[2] that "those who can read the signs of the times, read in them that the Kingdom of Man is at hand."

The Kingdom of Man! He has established his position as the roof and crown of things, there is nothing above him or equal to him in the universe, if there be naught else that can think and freely act; and it therefore behoves him to take command of the position, as the only superior officer present. He has dispelled the phantoms of theology, which, phantoms as they were, did yet, in some sort of way, contrive, and for a considerable number of years, to furnish motives, which, in some degree, dominated the lives of men, and led them to make society possible, by agreeing to certain rules of the game of life, commonly called the moral law; rules which have prevented the world from presenting on a large scale the drama of the Kilkenny cats. Theology being gone, its laws have, of course, gone too, or at least the sanction on which they rested. But, as society will not go on without law, it is incumbent on the new rulers, as on Zeus and his brothers, when they had turned out their father's dynasty, to get their realm in order, by promulgating a new code, or at least by finding a new basis for the old one. It is into the latter problem, indeed, that their task resolves itself, for there seems to be a pretty general consensus, that, in themselves, the old laws were right; that justice, brotherly love, self-denial, truthfulness, and decency, must continue to rule the

[1] *Ibid.* March, 1884, p. 495. [2] *Essays*, p. 417.

world, if the world is to go on creditably, and if society is not to resolve itself into primitive nebula. The great difficulty is that, as there is no use in a law unless there be something to make men keep it, some motive power must be found to replace the fear of the Lord, formerly held to be the beginning of wisdom, and the love of Him, which was its end.

Our leaders of thought feel themselves abundantly equal to the task, and the air around is resonant with their voices, eagerly telling their several discoveries of what will fulfil the needful function. But it rather begins to look as if history were going to repeat itself; as if the necessary result of so lofty a station as that they have attained were to produce a confusion of tongues, such as once already is reported to have marred an enterprise of similar ambition. Our high authorities, it is apparent, have ceased to understand one another, for the main purport of the various utterances borne to our ears is flat contradiction, each of all the rest.

The materialist assures us, looking down to the base on which material science rests, that matter is all, and all is matter. In it, says Professor Tyndall,[1] "we discern the promise and potentiality of all terrestrial life. We claim, and we shall wrest from theology the entire domain of cosmological theory. The doctrine of evolution derives man, in his totality, from the interaction of organism and environment through countless ages past." "Thought," says Moleschott,[2] "is a movement of matter." Man is therefore only a machine, so constructed as to think, and in the mechanics of thought the chief factor is phosphorus; "without phosphorus no thought."[3] From this, of course, it follows that we are, as Professor Huxley has hinted, "but the cunningest of nature's clocks," and if so we need not trouble ourselves about any rule of action, for we can no more help doing what we do, than a clock can help striking.

[1] Belfast Address. [2] Quoted by Janet, *Materialism*, p. 34.
[3] Id. *Ibid.* p. 33.

But no sooner is the materialistic creed enunciated, than it is drowned in a tumult of scientific indignation. It is a doctrine, Mr. Leslie Stephen tells us,[1] already dead and buried, and "it has died because it is too absurd a doctrine even for philosophers. It is as easy as it is edifying to expose materialism. As Comte says, it is the most illogical form of metaphysics." Professor Huxley, though he sails very near the wind in its regard, is resolved to find a way to avoid falling into a doctrine, of which he tells us,[2] "I believe materialism to involve grave philosophical error." "Utter materialism and necessarianism," according to the same authority, is "crass;"[3] it "may paralyze the energies, and destroy the beauties of a life."[4] Professor Clifford pronounces it, though resting on high authority, to be a "singular" doctrine, "founded on confusion of thought."[5] Mr. Leslie Stephen goes on to stigmatize it as a "degrading" doctrine which "men of science have abandoned, as completely as metaphysicians." He declares that "to say that intellect is made up of phosphates is not so much error as sheer nonsense."[6]

Materialism, then, is clearly naught according to scientific canons. But why, continues its last-quoted opponent, should we trouble our heads about any doctrine at all? Let us take things as we find them. We are men; what matters it how we became so? We have our actual powers and faculties none the less if they have been derived from lowly, and, to our minds, disgusting, ancestors. Here they are and let us use them. And so for our ideas of what it is proper to do. Probably those ideas originated in the struggles and needs of brute progenitors, "dragons of the prime that tare each other in their slime," and so on down to the last link, *Simia quam similis turpissima bestia nobis.* But what of that? "Property is not the less sacred because it originated in physical force;"[7] nor marriage because the primitive rite was probably

[1] *Essays on Freethinking*, p. 89.
[2] *Lay Sermons*, p. 139. [3] *Ibid.* p. 140. [4] *Ibid.* p. 146.
[5] *Essays*, p. 328. [6] *Ibid.* pp. 89, 90. [7] *Ibid.* p. 91.

to fell the beloved object with a club and carry her off in triumph.[1] Our religion, therefore, if religion we must have, should consist in respecting and acting on those principles which mankind have, somehow or other, come to acknowledge. This is the simple creed formulated by Sir James Fitzjames Stephen, who with his brother appears to operate in a corps of freethinkers unattached. "If," he says,[2] "human life is in the course of being fully described by science, I do not see what materials there are for any religion, or indeed what would be the use of one, or why it is wanted. We can get on very well without one, for though the view of life which science is opening to us, gives us nothing to worship, it gives us an infinity of things to enjoy. The world seems to me a very good one, if it would only last; love, friendship, ambition, science, literature, art, politics, commerce, professions, trades, and a thousand other things, will go on equally well, as far as I can see, whether there is or is not a God or a future state."

But this simple creed finds scant favour in other well-informed quarters, in fact its simplicity is not precisely considered to constitute a merit. According to Mr. Harrison, it is an "original idea"[3] on the part of Sir James. Love! friendship! good-nature! kindness! whence, on such principles as his, is he going to get these excellent things? Nor does it seem probable to Mr. Harrison[4] that for the work of purifying the great masses of mankind, an agent will be discovered in the common-sense maxim that "This is a very comfortable world for the prudent, the lucky, and the strong." No, no! theology, to be sure, is gone: a clean sweep has been made of that; but Mr. Harrison is quite positive that religion must remain: we must have an object towards which to direct our love and our duty, and a sense of duty to make us do it. Mr. Spencer concurs. Religion is the word: they are wrong who think that science is

[1] *Essays*, p. 80.
[2] *Nineteenth Century*, June, 1884, p. 917.
[3] *Ibid.* Sept. 1884, p. 377. [4] *Ibid.* Sept. 1884, p. 378.

dissipating religious beliefs and sentiments,[1] for, he tells us, "whatever of mystery is taken from the old interpretation is added to the new," which it certainly would seem to be, with compound interest. But at all events Mr. Spencer is as firm as Mr. Harrison, that religion there must be, and that it is the highest outcome of development. He pronounces that[2] "the ultimate form of religious consciousness, is the final development of a consciousness, which at the outset contained a germ of truth obscured by multitudinous errors."

Of like mind is Professor Clifford. All religions hitherto existent, have, it is true, been, to his mind, as bad as can be; so bad that they must be spoken of in whatever terms seem most likely to pain and shock their adherents. But for all that, says he,[3] "there are forms of religious emotion which do not thus undermine the conscience," and such a form is "Cosmic Emotion."[4]

But Mr. Harrison will not stand this: it is flat pantheism. For Cosmic Emotion means awe, and delight, and poetic rapture, in view of the universe as such, of the starry heavens, the clouds, the ocean, the alps. And how can this be religion unless the universe be God? But to say that everything is God is just as absurd as to say that everything is matter. To say that everything is God, is to say that right and wrong are equally Divine, that "being and not being are identical, and that the identity of being consists in its being the union of two contradictories."[5] "If," he continues,[6] "God and universe are identical expressions, we had better drop one of them. Let us, in the name of sense, get rid of these big vague words, and having got rid of God and soul, as a verbal spiritualism, let us say simply—things, and have the courage of our opinions, and boldly profess as our creed, 'I believe in nothing except in things in general!'"

[1] *Nineteenth Century*, Jan. 1884, p. 10. [2] *Ibid.* p. 9.
[3] *Essays*, p. 386. [4] See Essay under this title, pp. 394—417.
[5] *Nineteenth Century*, August, 1881, p. 289. [6] *Ibid.*

He goes on to inquire what practical benefit a cultivation of Cosmic Emotion is likely to bring to mankind; whether it will serve to comfort the sorrowful, to counsel the doubtful, to sustain the weak, to compel the wayward. Go, he suggests, and tell a debauchee to control his passions, by thinking that they are part of the Divine Essence; console the widow and the orphan by talking of sunsets or stellar infinities; "and when social passions rage their blackest, step forward with the religion of sweetness and light, and try if self-culture, so exquisitely sung by Goethe and his followers, will not heal the social delirium. It would be like offering roses to a famished tiger, or playing a sonata to a man in a fever."[1] "When people," he adds,[2] "decline to be bound by the cords of a formal theology, and proclaim their devotion to these facile abstractions, they are really escaping in a cloud of words from giving their trust to anything: for 'Things in general, as understood by myself,' is only a roundabout phrase for that good old rule, the simple plan—'What I like.'"

So far, therefore, it would appear that we have not got far forward in our quest: but then we have not yet given ear to the great upsetter of theologies, Mr. Spencer himself, to whom, if to any one, belongs the right of setting up a new order in their stead; for to the victors belong the spoils. He, of course, has his suggestion ready. He tells us in effect[3] that others miss the mark, because they do not look with the philosophic eye, and do not look in the right direction: they do not duly explore the new region into which science has lifted us. It contains nothing, to be sure, which we know, or can know: but what then? It follows that it contains what we know not and can never know: the great Unknowable. This must be the true object of evolved worship; in it we shall find all that we require: "An Infinite, Eternal

[1] p. 290. [2] p. 289.

[3] "Religion: a Retrospect and Prospect," *Nineteenth Century*, Jan. 1884.

Energy, from which all things proceed."[1] But we are not to mistake him: it is not another name for God. He cannot tell us what it is, but, what it is not: for not He, but It, is its style and title: It has not mind, It has not will: Its attributes are negative, "the Ultimate Reality transcending human thought."[2]

These are solemn and sonorous tones, but, unlike those of Virgil's grave and meritorious man, they by no means induce the crowd of disputants to hold their peace and listen with outstretched ears. On the contrary, they only arouse a hubbub ten-fold more boisterous than before. Mr. Harrison clearly conceives this to be of all ridiculous proposals, by far the most ridiculous. It can at best, he declares, give us a "Ghost of Religion."[3] And as to its object: why the Unknowable? And why spell it with a big U? If you know nothing about it, how do you know it is unknowable? and how that it is infinite, eternal, or *an* energy, not energies? Write it with a small letter, therefore, and call it the unknown.[5] But, however it be spelled, Mr. Harrison is quite certain that it will never do for a god; and he sets to work with infinite gusto to hew in pieces Mr. Spencer's idol. "To make a religion out of the Unknowable," he says, "is far more extravagant than to make it out of the Equator, or the Binomial Theorem."[6] "If religion there is still to be, it cannot be found in this No-man's land and know-nothing creed:"[7] this creed, "summed up in one dogma—The Unknowable is everywhere, and Evolution is its prophet;"[3] a "creed having for its object such a mere *chimæra bombinans in vacuo*,"[8] which "might be a gooseberry or a parallelopiped."[9] Mathematics, he goes on, will enable us accurately to understand its nature. In them x standing always for the unknown, x^n must symbolize the Unknowable: so that "where

[1] *Nineteenth Century*, p. 12. [2] *Ibid.*
[3] See essay under this title, *Nineteenth Century*, March, 1884.
[4] p. 495. [5] p. 501. [6] p. 497. [7] p. 500. [8] p. 504.
[9] *Ibid.* Sept. 1884, p. 374.

two or three are gathered together to worship the Unknowable, they may be heard to profess their unwearying belief in x".[1] And its potency to do religious work he thus illustrates:[2] "A child comes up to our Evolutionist friend, looks up in his wise and meditative face, and says: 'O wise and great master! what is religion?' And he tells that child: 'It is the presence of the Unknowable.' 'But what,' asks the child, 'am I to believe about it?' 'Believe that you can never know anything about it.' 'But how am I to learn to do my duty?' 'O, for duty you must turn to the known, to moral and social science.' And a mother wrung with agony for the loss of her child, or the wife crushed by the death of her children's father, or the helpless and the oppressed, the poor and the needy, men, women, and children, in sorrow, doubt, and want, longing for something to comfort them and to guide them, something to believe in, to hope for, to love, and to worship, they come to our philosopher, and they say, 'Your men of science have routed our priests, and have silenced our old teachers. What religious faith do you give us in its place?' And the philosopher replies (his full heart bleeding for them), and he says, 'Think on the Unknowable.'"

"One would like," he adds,[3] "to know how much of the Evolutionist's day is consecrated to seeking the Unknowable in a devout way, and what the religious exercises might be. How does the man of science approach the All-Nothingness? the microscopist? or the embryologist? or the vivisectionist? What do they learn about it? What strength and comfort does it give them? Nothing, nothing, it is an ever-present conundrum, to be everlastingly given up." At most, "The religion of the Agnostic comes to 'the belief, that there is a sort of a something, about which I can know nothing?'"[4]

Mr. Harrison is not alone in his attack upon this unlucky deity. Sir James Stephen joins in the

[1] *Nineteenth Century*, March, 1884, p. 503. [2] *Ibid.* [3] p. 502. [4] p. 496.

onslaught with equal zest. "In fact," he says,[1] "Mr. Spencer's conclusion appears to me to have no meaning at all. It is so abstract that it asserts nothing. It is like a gigantic soap-bubble, not burst but blown thinner and thinner, till it has become absolutely imperceptible. If this is the prospect before religion, it would surely be simpler to say that the prospect before it is that of extinction. But if this conclusion is reached, why not say so plainly?"

But, as we have seen, this is just the conclusion that must not be reached. Religion there must be, and as Mr. Spencer cleared the ground of theology, so Mr. Harrison has cleared it of all rival philosophic systems, including Mr. Spencer's own, and the world stands vacant for the religion of the future, Mr. Harrison's peculiar creed.

All have erred fundamentally, he tells us, who do not look for a basis at once solid and vital, whereon to build. Science alone can give us solidity, but only one branch of science can give vitality besides. Matter, things in general, the sun, moon, and stars, the Unknowable, on none of these can we found a rule of duty, none will serve as a stimulus for right-doing. Those of them which we can know we cannot love, the unfortunate Unknowable we cannot even know. Yet "what," he asks,[2] "is religion for? Why do we want it? What do we expect it to do for us? If it can give us no sure ground for our minds to rest on, nothing to purify the heart, to exalt the sense of sympathy, to deepen our sense of beauty, to strengthen our resolves, to chasten us into resignation, and to kindle a spirit of self-sacrifice—what is the good of it? Religion is not a thing of star-gazing and staring, but of life and action."

Where are we to find a basis for such a religion as will do all this? Theology is out of the question, for, *ex hypothesi*, it has been finally disposed of by Mr. Spencer. We are confined to science, and, as already intimated, amongst the objects whereof

[1] *Nineteenth Century*, June, 1884, p. 908.
[2] *Ibid.* March, 1884, p. 501.

science treats, there is but one that can awaken in us any feeling that prompts to action. This solitary object is man: it follows that man must be the object of rational religious emotion, and that the religion of science must be that founded by M. Comte: the Religion of Humanity, or Positivism.

"The purpose of the Positive Scheme," Mr. Harrison tells us,[1] "is to satisfy rational people that, though the ecstatic 'worship' of supernatural divinities has come to an end, intelligent love and respect for our human brotherhood will help us to do our duty in life. In plain words, the Religion of Humanity means recognizing your duty to your fellow-men on human grounds." The object of its cult is collective man—Humanity. "When we think of Humanity our minds are not set on the band of the 'elect,' but on the millions, who people the earth and subdue it, leaving each century on the whole a richer inheritance in comfort, in thought, in virtue."[2] The great end to be proposed to the religious mind is so to live as to help on the increase of this inheritance, and thus to make unborn ages somewhat better for each of us having lived. In this we find a motive power sufficient to make us live well, a stimulus made more active when we cast a respectful glance at the more bright particular stars of our race, who have so lived in the Past—the saints of the Positivist Calendar. "It is for this reason that M. Comte has insisted so much on the Past, and the religious value of a true conception of human civilization."[3] "Those who know the harmonious power with which Comte has called forth into life the vast procession of the ages, can best judge how weak by his side Mr. Spencer appears."[4]

Such, in outline, is Mr. Harrison's position. His statement has the merit of being perfectly clear and intelligible; but alas! alas! the clearer he makes it, the more does it excite the scorn and contradiction of his philosophic friends: nay, they find in it every

[1] *Nineteenth Century*, Sept. 1884, p. 369.
[2] *Ibid.* p. 372. [3] p. 373. [4] p. 367.

one of those fatal flaws which he has taught them to see in other systems, aggravated by not a few peculiar to itself.

Says Sir James Stephen,[1] "Is not Mr. Harrison's own creed open to every objection which he urges against Mr. Spencer's? Humanity, with a capital H, is neither better nor worse fitted to be a god, than the Unknowable, with a capital U. They are as much alike as six and half a dozen. Each is a barren abstraction to which any one may attach any meaning he likes. It seems to me that it is just as 'unknowable' as the Unknowable itself, and just as well and just as ill-fitted to be an object of worship. But if Mr. Harrison's religion presents to the mind no object of worship, has it the smallest chance of being able to 'govern men and societies'? The Unknowable is certainly singularly ill-adapted for the functions of government, but Mr. Spencer never proposed to govern by it. Mr. Harrison does propose to govern. How does he mean to set about it? What will Positivism do with the vast mass of indifferent and worldly people? It can neither hang them nor damn them."

Mr. Spencer has a chapter of faults equally grave to urge against it. In the first place, Positivism is essentially unphilosophic; it contradicts the law of evolution: it is a "Retrogressive Religion."[2] Its unphilosophic character is manifest in its absurd respect for authority. "Papal assumption is modest compared with the assumption of 'the founder of the Religion of Humanity.'" Moreover Mr. Spencer discovers in it precisely the same absurdity which Mr. Harrison found in Pantheism: it tries to blend contradictories in ranking equally amongst its saints, men who hated each other fiercely and each other's principles, and who set a diametrically opposite example to the world—Frederick the Great and St. Paul, Louis the Eleventh and Washington, Locke, Cyrus, and Fénélon, to say nothing of Hercules

[1] *Nineteenth Century*, June, 1884, pp. 909—912.

[2] See article under this title, *Nineteenth Century*, July, 1884.

and Orpheus.[1] Surprise is the feeling awakened in Mr. Spencer[2] on observing the incongruity between the astounding claims made by the propounder of this new creed, and the great intelligence of disciples whose faith "appears proof against the shock which these astounding claims produce on ordinary minds."

Professor Huxley, too, fails to be impressed either with the creed or its founder. He acknowledges that he found M. Comte potent in destruction, but thus continues:[3] "Great, however, was my perplexity, not to say disappointment, as I followed the progress of this 'mighty son of earth' in his work of reconstruction. Undoubtedly *Dieu* disappeared, but the *Nouveau Grand-Etre Suprême*, a gigantic fetish, turned out brand-new by M. Comte's own hands, reigned in His stead. *Roi* also was not heard of, but in his place I found a minutely-defined social organization, which, if it ever came into practice, would exert a despotic authority such as no sultan has rivalled, and no Puritan presbytery, in its palmiest days, could hope to excel. While as for the *culte systématique de l'Humanité*, I, in my blindness, could not distinguish it from sheer Popery, with M. Comte in the chair of St. Peter, and most of the names of the saints changed."

Professor Huxley, moreover, does not seem to discern M. Comte's 'harmonious power,' but, on the contrary, considers him a singularly unfortunate head for a scientific religion. He found in Comte's writings, he tells us,[4] "the veins of ore few and far between, and the rock so apt to run into mud, that one incurred the risk of being smothered in the working." Moreover,[5] "that part of M. Comte's writings which deals with the philosophy of physical science appeared to me to possess singularly little

[1] *Ibid.* p. 11. To the list might be added such choice specimens as the following: Moses, Numa Pompilius, Mahomet, Godfrey de Bouillon, St. Bernard, Voltaire, St. Ignatius, Hobbes, Richelieu, and Heloise.

[2] *Nineteenth Century*, p. 10.

[3] *Lay Sermons*, p. 148.

[4] *Lay Sermons*, p. 147.

[5] *Ibid.* p. 154.

value, and to show that he had but the most superficial and merely second-hand knowledge of most branches. He was at once singularly devoid of real knowledge in these subjects, and singularly unlucky. I find therein little or nothing of any scientific value, and a great deal which is as thoroughly antagonistic to the very essence of science as anything in ultramontane Catholicism. In fact, M. Comte's philosophy in practice might be compendiously described as Catholicism *minus* Christianity."[1]

But it is for the object of devotion that the full vials of scorn are reserved. "The Great Being Humanity," says Mr. Spencer,[2] has done nothing for us, and how could it? Look at the common herd of unphilosophic men and see what a sorry lot they are. The Northern Farmer was clearly right: "Take my word for it, Sammy, the poor in a loomp is bad."[3] And even of the people who remain after leaving out the worst—"mostly fools," will evidently be the verdict of other sages than him of Chelsea. Humanity, in fact, declares Mr. Spencer,[4] is like nothing so much as a bubble floating on the great river of the Unknowable, and a Positivist would be fitly typified by a man who should look at the bubble and ignore the stream. "Even if, instead of being the dull leaden-hued thing it is, the bubble Humanity had reached that stage of iridescence of which, happily, a high sample of a man or a woman sometimes shows us a beginning, it would still owe whatever there was in it of beauty to that Infinite Eternal Energy, out of which Humanity has quite recently emerged, and into which it must in course of time subside." "I am told," he continues,[5] "that by certain of M. Comte's disciples (though not by those Mr. Harrison represents), prayer is addressed to 'holy' Humanity. Had I to choose an epithet, I think 'holy' is about the last which would occur to me. So far from seeing in the Great Being Humanity anything worshipful, it seems to me that the con-

[1] p. 140.
[2] *Nineteenth Century*, July, 1884, p. 15. [3] p. 23. [4] p. 17. [5] p. 15.

templation of it is calculated to excite feelings which it is best to keep out of consciousness."[1]

Still less would the epithet 'holy' suggest itself to Sir James Stephen. "Mankind," he exclaims,[2] "is the object of our worship—mankind; a stupid, ignorant, half-beast of a creature. For my part, I would as soon worship the ugliest idol in India."

Finally, we are assured that humanity is itself so little captivated by the invitation to its own worship, that a Positivist congregation may be compendiously described as "Three persons—and no God;" and if Mr. Harrison tells Mr. Spencer[3] that he has "defecated religion to a true transparency," Sir James Stephen responds[4] that "Mr. Harrison's language about awe and gratitude to humanity (the mainspring of his religion), represents nothing at all except a yearning for some object of affection, like a childless woman's love for a lapdog."

There is a game known to unphilosophic children as Blindman's Buff. In it all have full use of their eyes, excepting him on whom for the moment devolves the office of seeking. Would it not rather appear as if the Fates, in sportive mood, had turned the game of our philosophers into something of the kind? They are marvellously keen-sighted, none keener, so long as they have but to worry and harass the unfortunate groper after truth, and they never fail to find the exact right spot on which to pummel him. But the moment their own turn comes to set out on the quest, as if they had donned the fatal bandage, they are inevitably delivered over helpless to their tormentors.

It would therefore seem that the result of our quest is not very brilliant, and that having gone out for wool we are likely to come home shorn to the quick, stripped not only of theology but of the comforts of philosophy as well. When Cadmus sowed the dragon's teeth, the warriors who came up there-

[1] *Nineteenth Century*, June, 1884, p. 917.
[2] *Ibid.* June, 1884, p. 917. [3] *Ibid.* March, 1884, p. 500.
[4] *Ibid.* June, 1884, p. 911.

from slaughtered each other pretty effectually, it is true; but there were five who survived, and these sufficed to found Thebes. But of our *pentathlon* of rival systems, which would appear to exhaust the possibilities, can any one outlive the thrust of the poisoned rapier that we have seen pass from hand to hand in the course of the struggle? If these be indeed the clear thinkers we have been taught to take them for, is it not most disquieting to have a verdict of four to one against every single proposal that has been put forward? Must the verdict be, as in that "caucus race" witnessed by Alice in Wonderland, that every one has beaten every one else?

If any positive verdict be at all within our reach, it must certainly be arrived at by a process similar to that adopted by the Greeks when they wished to decide who had been the hero of Salamis. Each of the captains who had to vote put himself first, but they unanimously put Themistocles second. And in our inquiry it is to be observed that while none of the disputants will grant any status at all to any philosophic groundwork of religion, except his own peculiar vanity, they acknowledge that the old belief had after all some sort of merit. It was false to be sure, on that they are agreed, but it could and did to some extent influence the lives of men; and was therefore far better for its purpose than the substitutes proposed by rival sages, which can never do anything of the kind.

Thus Professor Clifford, though as a rule anything connected with the name of God produces upon him much the same effect as we read of in the case of the young man "whom immediately the spirit troubled, and being thrown down he rolled about foaming," in a passage unusually plain and clear[1] "fully admits" that the theistic hypothesis is in itself "a reasonable hypothesis, and an explanation of the facts," which is a great deal more than he will say for "that singular materialism of high authority and recent date,"[2] which he appears to consider the only possible philo-

[1] *Essays*, p. 388. [2] *Ibid.* p. 328.

sophical rival of his own creed. Mr. Spencer pronounces[1] that the "retrogressive religion of Humanity falls below the creeds to which men had already developed their minds. Humanity is only another sort of a name for ghosts and goblins: but men had come to something far higher in "the conception of a spirit far transcending humanity."

So Mr. Harrison for his part, sticking stoutly to his text that "the essence of religion is not to answer a question, but to govern and unite bodies of men,"[2] and while positively certain that neither the cultus of the Unknowable nor Cosmic Emotion will ever do this for one instant, yet acknowledges[3] that "theologies long did it," did it "for twenty or thirty centuries," and did it so well that[4] "the hallowed name of religion *has meant* in a thousand languages, man's deepest convictions, his surest hopes, the most sacred yearnings of his heart, that which can bind in brotherhood generations of men, comfort the fatherless and the widow, uphold the martyr at the stake, and the hero in his long battle." This is surely pretty well, and it would seem that on its own principles positivism should include in its objects of veneration the agent which has done all this for humanity, and exhibit to the world one more spectacle of the identity of contradictions, by the strange phenomenon of a religion worshipping its own rival; for undoubtedly theology has thus, by Mr. Harrison's showing, done a great deal more for mankind than any individual saint of the Positivist calendar; its domain is already the irrevocable Past, while positivism aspires, and can aspire, to no more than the uncertain Future. More than this, Mr. Harrison would appear, *in seipsum saeviturus si desint alii*, to admit, in an unguarded moment, that his creed can never fill the place of the old belief. When declaiming against Mr. Spencer's Unknowable, and recounting all that it would have to do, in order to supply the void left in human needs by the destruction of faith,

[1] *Nineteenth Century*, July, 1884, pp. 12, 13.
Ibid. March, 1884, p. 497. [3] p. 499. [4] p. 504.

he emphatically tells us[1] that men demand something to *worship*. This cannot be the Unknowable: but he presently adds that neither is it Humanity. "We do not ask any one to worship Humanity." "Humanity is neither the shadow of God nor the substitute for God, nor has it any analogy with God."[2] Can he be serious, then, in proposing to make it take the place of God, and in expecting it to fill the void which he himself so eloquently described, as the result of the disappearance of belief in God?

Sir James Stephen, for once, fully agrees with Mr. Harrison about Humanity. It certainly is not an object of worship, and therefore Sir James infers that no more than Cosmic Emotion or the cult of the Unknowable will it have the slightest chance of doing any sort of work at all. He does not, as we have heard, himself see the need of any religion at all, but he takes advantage of the "originality" of this position to assure all and sundry of his philosophic friends that if religion there is to be they will find none to work at all but Christianity.[3] It has worked so long, precisely because it differs in every essential respect from its proposed substitutes. Unlike the creeds of Mr. Spencer and Mr. Harrison, it deals with the Personal not the Abstract, with the Known not the Unknown. Jesus Christ, says he, has reigned so long "the object of passionate devotion and enthusiasm" to so great a multitude of all times and all lands, only because He has been believed to be living, and to possess authority, which His acts had proved to be Divine. All who set about to found a new religion, without providing themselves with some sort of credentials to the same effect, are foredoomed to failure, and Sir James points the moral by the well-known story of Talleyrand, who when consulted by a Frenchman as to the best mode of getting a new creed afloat, recommended him to try the effect of being crucified and rising again in three days.

[1] *Nineteenth Century*, March, 1884, p. 500. *Vide supra.*
[2] *Ibid.* Sept. 1884, p. 369. [3] *Ibid.* June, 1884, p. 911.

The practical conclusions, then, to be gathered from this war of words, would seem to reduce themselves to two. Man requires a religion for a special work; and this special work can as a matter of fact be done only by a theology. This is unquestionably a good deal to have learnt; and it at once suggests the question, If a belief in God can thus supply our wants, "is not that very divination of our needs in itself a proof that it is the supply of them?"[1]

At any rate, when we thus see theology stamped, at the hands of its bitterest enemies, with what looks so strangely like a note of truth, we must needs be thrown back on our starting-point, and ask ourselves whether it be not just possible that, after all, the walls are still standing, whereof this not altogether harmonious blare of trumpets has announced the overthrow.

And still confining our attention to the testimony of our advanced thinkers, without any addition of our own, it is, to say the least, instructive to observe, that while the work of destroying theology has been done by pure exercise of reasoning, and while our friends think a great deal on one another's reasoning power, so long as it is in agreement with themselves, they find no absurdities too great for it to perpetrate, so soon as they begin to differ.

Mr. Spencer, for example, to whom, according to Mr. Harrison, belongs the chief credit of having cleared out Olympus, wins this praise by an essay, which, while in accordance with Mr. Harrison's views, is described,[2] as "packed with thought, to a degree unusual even with Mr. Herbert Spencer," as a "memorable essay," wherein the evolutionary creed is formulated "with a definiteness such as it never wore before," and theology receives a blow that is absolutely "final." But in the self-same essay, and indeed in that part of it which is its main purport, having the misfortune to disagree with Mr. Harrison, Mr. Spencer, we are assured, proceeds to fall into

[1] Newman, *Grammar of Assent*, p. 48.
[2] *Nineteenth Century*, March, 1884, p. 494.

"a paradox as memorable as any in the annals of the human mind,"[1] to talk "a theologico-metaphysico jargon," and to take refuge from an awkward dilemma by a mere rhetorician's artifice.[2] His theory of the origin of religion is pronounced to be full of paradoxes, and Mr. Harrison frankly avows that he has always considered it the most unlucky of all Mr. Spencer's sociologic doctrines.[3] Moreover "a certain 'fallacy of the Den' runs through his historical notions;"[4] he even "hardly acts with the candid mind that befits the philosopher in all things;"[5] he falls into "the slip-slop of theologians;"[6] he asks us to take things as "proved" on the strength of "a pile of clippings made to order;"[7] if he does not think persistently along defined grooves, Mr. Harrison does not know what that process means;[8] he makes singular slips in logic;[9] he has fallen at various times into astounding paradoxes, which Mr. Harrison respects him too much to recall;[10] and finally he is warned,[11] great philosopher as he is, that "philosophers who live not so much in glass houses as in very crystal palaces of their own imagination, should give up the pastime of throwing stones at their neighbour's constructions."

It is undoubtedly very sad to find an apostle of the understanding doing all this sort of thing; but if we turn from Mr. Harrison's to Sir James Stephen's account of the matter, it looks no better. To him the evidence for Mr. Spencer's fundamental theory seems weak, and assuming the evidence the conclusion is not plain;[12] his argument appears to be an unmeaning play of words;[13] he reminds Sir James of the blind heathen derided by Isaias, "He works his words about this way and that, he accounts with part for ghosts and dreams, and the residue thereof he maketh a god, and saith Aha, I am wise, I have seen

[1] *Nineteenth Century*, March, 1884, p. 506.
[2] *Ibid.* p. 504. [3] *Ibid.* Sept. 1884, p. 362. [4] *Ibid.* p. 368.
[5] *Ibid.* p. 365. [6] *Ibid.* p. 359. [7] *Ibid.* p. 364. [8] p. 363.
[9] p. 374. [10] p. 366. [11] *Ibid.* p. 366.
[12] *Ibid.* June, 1884, p. 905. [13] p. 907.

the truth." In brief, though his work of negation is not to be gainsaid, the positive part appears to be unfounded, nay "baseless, and wholly unimportant."[1]

It is of course only to be expected that Mr. Harrison should, in his turn, hear some home truths from his candid friends. He also, according to Mr. Spencer, thinks persistently along defined grooves;[2] in fact, Mr. Spencer was the first in the field with this particular charge, and Mr. Harrison's counter-charge was of the nature of a *tu quoque*. Mr. Spencer likewise intimates that Comte and Mr. Harrison "commit intellectual suicide;"[3] than Mr. Harrison's performances in that line, misrepresentation can go no farther:[4] he is in an attitude of discipleship unfavourable to inquiry:[5] he exactly transforms the doctrine of opponents;[6] and his description of such doctrine is a fabric framed on his own imaginations.

As Mr. Spencer's strong point is metaphysics, so is Mr. Harrison's the science of man, which in his opinion affords a more solid foundation whereon to build, inasmuch as in the sublimer science "every philosopher falls from time to time into astounding paradoxes."[7] But, in his own field of predilection, Mr. Harrison appears to Sir James Stephen to assert a great deal more than he can possibly know:[8] even when they are in agreement, Sir James intimates that Mr. Harrison is plainly speaking much beyond his brief; "it is," he sarcastically remarks, "doubly satisfactory to agree with a man so positive and well informed;" a man who knows, or at least affirms, "which he would hardly do unless he knew," that in regard of times wholly prehistoric, one thing is true, "beyond all doubt," and "nothing is more certain than another," "not even," suggests our critic, "the multiplication table." While Mr. Harrison, who can generally be trusted to give as good as he gets, sets down Sir James' utterances about Humanity as "the ravings of Timon of Athens."

[1] *Ibid.* [2] *Ibid.* July, 1884, p. 5.
[3] *Ibid.* [4] p. 6. [5] p. 8. [6] *Ibid.* Nov. 1884, p. 831.
[7] *Ibid.* Sept. 1884, p. 366. [8] *Ibid.* June, 1884, p. 908.

Finally, to explain in one word the vagaries of his antagonists, Mr. Harrison tells us that they are "merely philosophers attacking an opponent."[1]

Just so! Philosophers attacking an opponent are evidently not to be trusted for philosophy. It would appear to be the part of wisdom not to take on faith, bitter opponents as they are, their own assertion that belief in God has received its death-blow at their hands. We must first examine their reasoning, and, which is far more, must make sure that we understand it. It may be that we shall fail to make head or tail of it; and should we be lucky enough to discover what it means, it is not impossible that we shall yet find in it some of those fatal flaws, which in one another's case they have shown us in such profusion.

In a word, to confine ourselves to what we have heard, does it not seem to ordinary common sense, that, on their own showing, our philosophic thinkers, who would find in mere human science an object to satisfy the heart of man, are engaged in a Danaid's task of filling sieves with water, a task at which all the wit of man may labour everlastingly in vain? Does it not appear that we may sum up the matter in the words of a thinker, at least as clear as any to whom we have been listening, when he speaks[2] of "the impatience I feel at able men daring to put out for our acceptance theories so hollow and absurd."

So speaks Cardinal Newman, and, surely, by his mouth, speaks common sense.

[1] *Ibid.* Sept. 1884, p. 371.

[2] Cardinal Newman, Letter to Mr. Wilfrid Ward (*Clothes of Religion*, p. xix.)

BL 240 .G46 1891
SMC
Gerard, John, 1840-1912.

Science or romance?.

AIQ-2737 (mcab)